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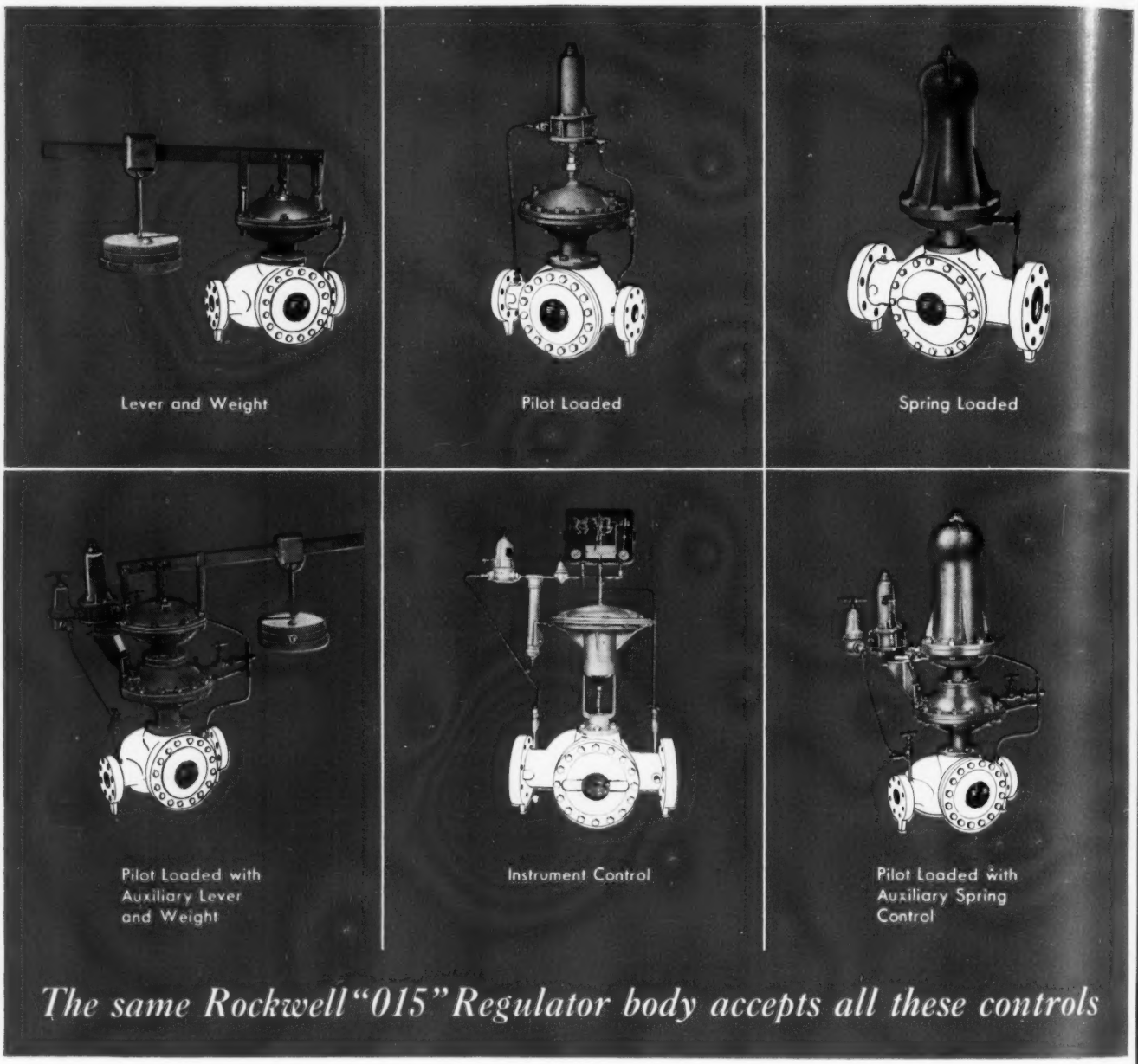
Gas Journal

THE MAGAZINE OF GAS DISTRIBUTION

COMPUTERIZED GAS DISPATCHING



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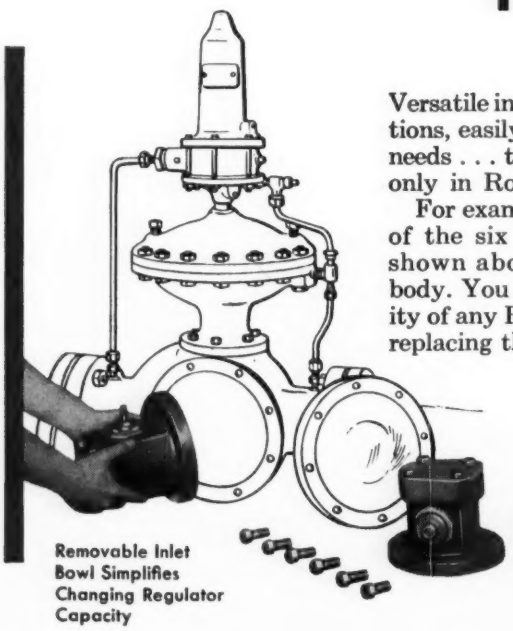

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Aquifer Storage

With this issue we begin a special four-part series discussing aquifer-type reservoirs for underground storage of natural gas. In the series, natural gas consultant Joseph Kornfeld will cover the how, why, what, and where of existing aquifer storage fields and relate how they are found and developed. Importance of aquifer storage to the gas distribution industry can be found in the fact that most of the gas utilities serving major metropolitan areas (and, in fact, most gas utilities) are not located near depleted oil and gas fields that can be converted to underground storage fields. Aquifers, however, are found in most areas of the U. S. and utilization of these unusual natural storage "tanks" is seen as becoming increasingly more important in coming years.

Computerized Gas Dispatching

In February, AGJ told you about a new computerized gas dispatching system being installed by Public Service Company of Colorado. This month, you're invited on a photographic "guided tour" of the computerized system for an inside look at how it works . . . plus a how and why report on its operation by PSCo's chief dispatcher, Ray Silkensen.

Tools and Techniques . . .

New ideas, new developments, and new methods in the gas distribution field are also featured in this issue . . . such as Wisconsin Public Service Company's use of plastic pipe for service renewals . . . a new automatic, high-pressure LPG-air plant installed by the Plymouth division of New Bedford Gas Company . . . automatic reading of industrial gas meters by telephone at Northern Illinois Gas Company . . . a report on Philadelphia Gas Work's highly successful dealers sales program . . . and a report on Brooklyn Union Gas Company's new Jamaica Bay Line and how its construction for 1960 was planned . . . plus reports on compact cars, Denver's biggest gas meters, the world's biggest underground storage station, and a fuel-for-thought article on electric heating and what you should know about it.

Next Month

Milwaukee Gas Light Company's automated gas dispatching system that utilizes field computers and central data logging . . . a report on the conversion of street service records to punched cards to provide faster access to information . . . and reports on liquefied natural gas from both utility and supplier viewpoints . . . and part two of our series on aquifer storage, discussing engineering aspects.

American Gas Journal

ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

Volume 187 **April 1960** **Number 4**

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M C F

NEWS HILITES OF THE INDUSTRY

Coal industry efforts to squeeze a national fuels policy through Congress has taken a new twist. Last year Congress passed a "coal research bill" that was killed by pocket veto — because President Eisenhower disapproved putting the proposed "research" into a new independent agency. The 1960 version of the bill is almost identical with last year's — except that the research is made the responsibility of the Secretary of the Interior. "Research" is defined (as it was last year) as "scientific, technical, and *economic* research and the *practical application* of that research." "Economic research" could embrace about any kind of "study" and "practical application" of economic research could include recommendation of almost any kind of fuels policy. Of especial interest is the fact that the coal research bill — H.R. 3375 — passed the House on February 15 without a record vote and with not a single voice raised to question or object.

Reimbursement to utility companies for relocation of facilities caused by highway construction has been held "unconstitutional" in Arizona. The state's attorney general, Wade Church, said in an opinion that legislation providing for such reimbursement would violate two articles of the Arizona constitution that prohibit governmental "gifts" or "loans of credit" to private persons, and prohibit diversion of gasoline tax receipts to non-highway purposes. A reimbursement bill was killed in the state legislature two years ago. Similar legislation was to be introduced this year, either as an individual measure or as a rider to a bill.

A new American Standards project on installation and utilization of industrial gas equipment has been recommended by an ASA general conference. Suggested sponsor of the project is the American Gas Association. Working basis for the proposed ASA code will probably be a set of "recommended good practices" on industrial gas installations and equipment drawn up by the A.G.A. Industrial Gas Practices Committee some time ago *(A.G.A. Information Letters 70 and 70-A; for data, see pages 164 through 185,* AMERICAN GAS JOURNAL GAS HANDBOOK ISSUE, *August 15, 1959).* A new ASA sectional committee will be organized to handle the project after authorization by the ASA Standards Council.

More natural gas will go into intrastate sale to supply electric power generation plants this year. Oklahoma Development Resources Company plans to build some 300 miles of new lines during 1960 to tap natural gas reserves in the Anadarko and McAlester basins of Oklahoma. Gas will be delivered to four electric power plants of Oklahoma Gas and Electric Company. ODRC presently has two unconnected lines in operation serving OG&E's plants near Oklahoma City and Sulphur in the Sooner state. Annual deliveries through the new system will be an estimated 36 to 40-billion cu ft under 20-year contracts. Much of the gas supply will come from presently "shut-in" production.

City of Thomasville, Georgia, operates its own municipal gas system and its own municipal electric generating plant. The city likes to use natural gas in its power plant for boiler fuel. From 1955 through June 1958, the city used in its power plant some of the gas it bought from South Georgia Natural Gas Company for its municipal, tax free gas system. At 36¢ per Mcf, however, the gas was too expensive. In September 1958 South Georgia agreed to sell the city interruptible gas at 34.5¢ per Mcf for power plant use. South Georgia said the sale was not a new service and didn't need FPC certificate authorization. FPC disagreed. The examiner hearing the case said the sale wasn't in the public interest and noted that the city would save only $560 per year by using interruptible gas.

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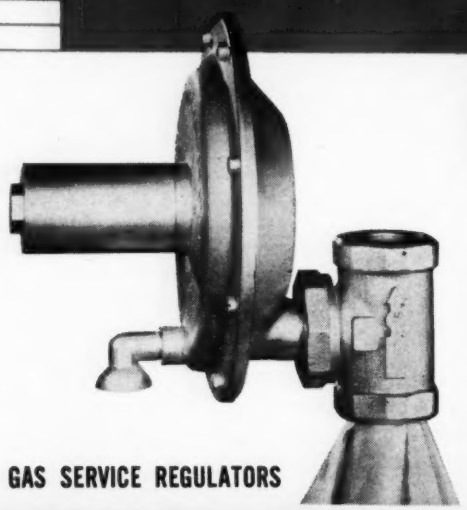

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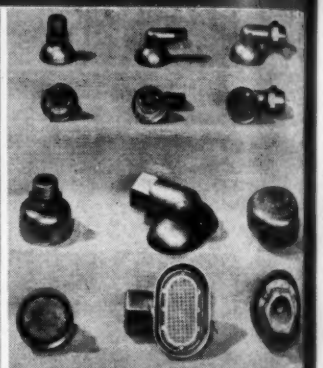
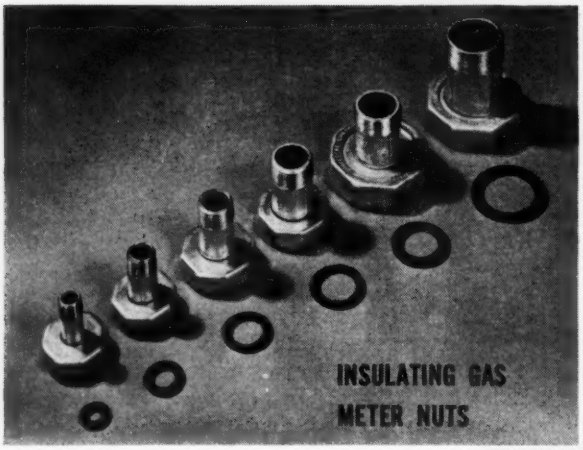


WEATHER-PROOF AND BUG-PROOF REGULATOR BREATHER VENTS



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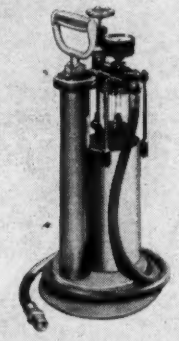

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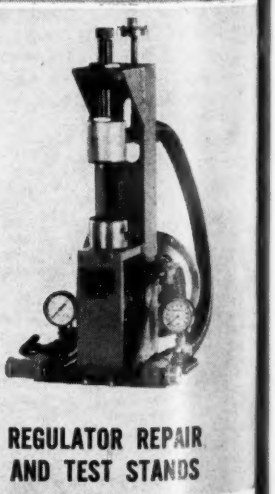

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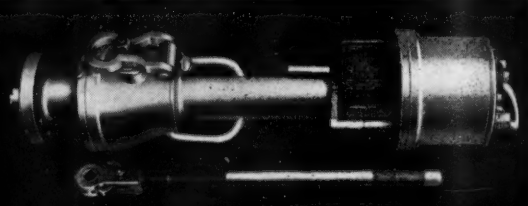
■ Large service connections can be made in just a few minutes when your crew is equipped with a Mueller CH-6 Drilling Machine and H-17235 Stopping Machine. These compact machines are ideal for connecting 3″ and 4″ lines under pressure. Automatic operation of the "CH-6" simplifies the operator's job, assures safe operation and greatly reduces the time factor.



CH-6 DRILLING MACHINE

- . . . makes cuts from 2″ to 6″
- . . . shell cutters designed for cutting any type pipe
- . . . up to 24″ boring bar travel
- . . . for pressures to 1440 p.s.i. at 100° F.
- . . . for temperatures to 500° F. at 1250 p.s.i.
- . . . features automatic operation *without supervision*
- . . . automatic feed disengagement and overtravel protection
- . . . direct reading tool position and feed indicators
- . . . telescopic design for handling ease
- . . . self-adjusting boring bar packing
- . . . for power operation with air or gasoline engine drive unit
- . . . may also be operated by hand

H-17235 STOPPING MACHINE

- . . . inserts and extracts plugs in 3″ and 4″ flanged tees, line stopper fittings and drilling nipples
- . . . for pressures to 100 p.s.i.
- . . . for temperatures to 250° F.
- . . . hand operated

These machines and fittings are just a small part of Mueller's complete system of No-Blo products — products especially designed for working with fluids under pressure.

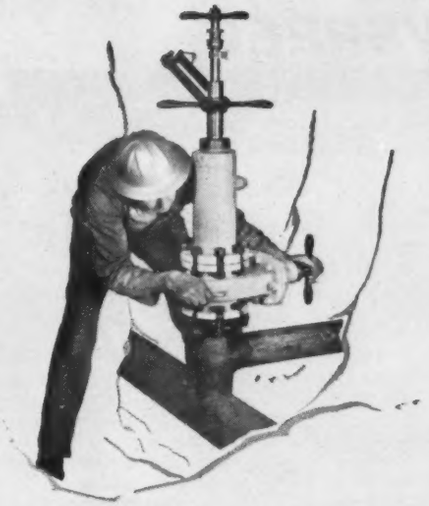
These few simple operations are all hat are needed to quickly connect a 4" teral under pressure to a steel main ith a No-Blo Flanged Tee.

WELD

move cap and loosen plug. Weld anged Tee to main. Weld lateral to anged Tee. Complete lateral to first ut-off. Test welds with soapsuds. t gate valve—hand tight—to fitting d open valve.

CUT

vance boring bar until pilot drill al- st contacts main. Test set-up for ssure tightness. Set amount of cut eded and engage automatic feed. unt air motor on machine and open ttle. ("CH-6" will automatically ke cut and disengage feed with- supervision.) Lateral now in op- tion. Retract boring bar to rear- st position. Close gate valve and move machine.

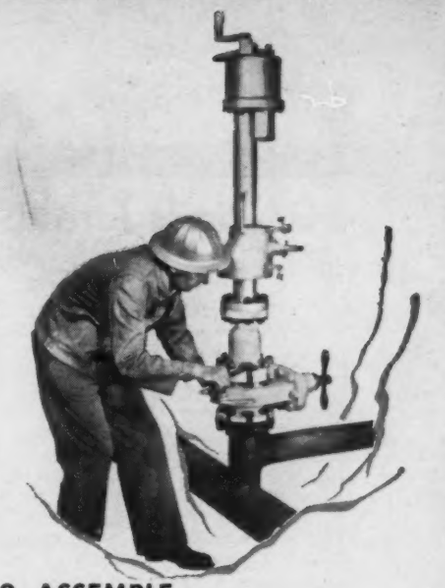


2. ALIGN

Attach alignment tool and completion plug to shaft of H-17235 Stopping Machine. Bolt machine—hand tight—to gate valve. Align machine and valve with fitting. Insert plug into fitting and tighten bolts. Mark position of machine on valve. Remove completion plug and machine.

5. PLUG

Fasten inserting tool and completion plug to shaft of "H-17235." Bolt machine to gate valve in same position as marked. Open gate valve and insert plug solidly into top of fitting. Test tightness of plug with bypass valve. Release plug and remove machine and gate valve.



3. ASSEMBLE

Bolt adapter to CH-6 Drilling Machine. Advance boring bar with rapid feed hand crank. Attach cutter arbor, pilot drill and shell cutter to boring bar. Retract boring bar to rearmost position. Bolt machine to open gate valve.

6. CAP

Position gasket on flange of fitting. Bolt completion cap firmly in place. Test entire set-up with soapsuds. Connection now completed and ready for backfilling.

Write for complete information and specifications.

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NEWSREEL

SGA Sails Into "Sizzling Sixties"

Natural gas's role in the wonderful world of the "Sizzling Sixties" will get a thorough examination at the Southern Gas Association's fifty-second annual convention at Galveston, Texas, April 25-27.

Ernest G. Hotze of Houston, SGA's General Convention Chairman has singled out some of the program high lights:

- A Distribution Section panel to present proved practical methods of reducing operating costs—Louis B. Hulcy of Lone Star Gas Co., W. M. Nunn Sr., of New Orleans Public Service Inc., C. C. McEachern and Edwin D. Nuttall of United Gas Corp., and W. C. Dahlman of Houston Natural Gas Corp.
- A frank look at the gas appliance business and a comparison with its competition by top executives of three major appliance manufacturers — Judson S. Sayre, president of Norge Sales Corp.; Lee A. Brand, vice president of Empire Stove Co., and E. Carl Sorby, vice president of Geo. D. Roper Sales Corp.
- A panel of editors will discuss the prospects of the gas industry—Dean Hale of the *American Gas Journal*, J. Fred Ebdon of *Gas*, Harold W. Springborn of *Gas Age*, and Melvin A. Judah of *Pipe Line Industry*.
- An entire session on gas air conditioning, featuring E. F. Davis of Chattanooga Gas Co., on sales methods and prospects; Charles A. Ashby Jr. of Stone & Webster Service Corp., on rates; Robert B. Smith of the American Gas Association, on research developments, and C. W. Nessell of Minneapolis-Honeywell Regulator Co., on efficiency.
- A discussion of one of the problems of the day—emotional disturbances—by Dr. Robert L. Sutherland, director of the Hogg Foundation for Mental Health, for the Accident Prevention Council.
- Some answers to the knotty problem of communication in the business world, from Prof. Alex G. Warren of Oklahoma State University, at an Accounting Section meeting.
- A look at "The New Interest in Public Affairs," by Harold S. Skinner, director of public affairs for Continental Oil Co., at the Human Relations Session.

Sessions will be held in Galveston's new multi-million-dollar Moody Convention Center, with its wall-size picture windows overlooking the Gulf of Mexico.

Convention entertainment program includes the traditional Monday evening Friendship Hour which will be in the form of a fabulous Gay Nineties Gas Light Party and on Sunday evening, before the official convention opening, the associate members will give a reception for SGA officers and directors. In addition, all registrants will receive membership cards in seven of Galveston's private clubs.

Plans for the merger of Pacific Natural Gas Co., Longview, Washington, with Cascade Natural Gas Corp., Seattle, have been announced by O. Marshall Jones, president of Cascade, and Arthur Faragher, Pacific Natural president. Stock would be exchanged on a share-for-share basis. Merger, subject to approval of stockholders, regulatory commissions of Washington and Oregon, and holders of certain other securities is not expected to be completed until the end of 1960. Meantime, operating supervision will gradually be taken over by Cascade. Jones will succeed to the presidency also of Pacific Natural Gas, pending completion of the merger. The merger is expected to greatly enhance the possibility of bringing natural gas service this year to Aberdeen, Hoquiam Montesano, Cosmopolis, Elma, McCleary, and Kalama where Pacific holds franchises but is not yet providing natural gas service. Company now serves natural gas to seven communities—Longview, Kelso, Woodland, Castle Rock, Mt. Vernon, Monroe, and Snohomish, all in the State of Washington. Cascade serves 28 Oregon and Washington communities. With the addition of Pacific's service territory, Cascade will be serving approximately 20,000 customers in 42 towns in the two states. This will be the third merger for Cascade since last October. Late that month it acquired Eastern Oregon Natural Gas Co. of Ontario, Oregon, and Consumers Gas Corp. of Bend, Oregon.

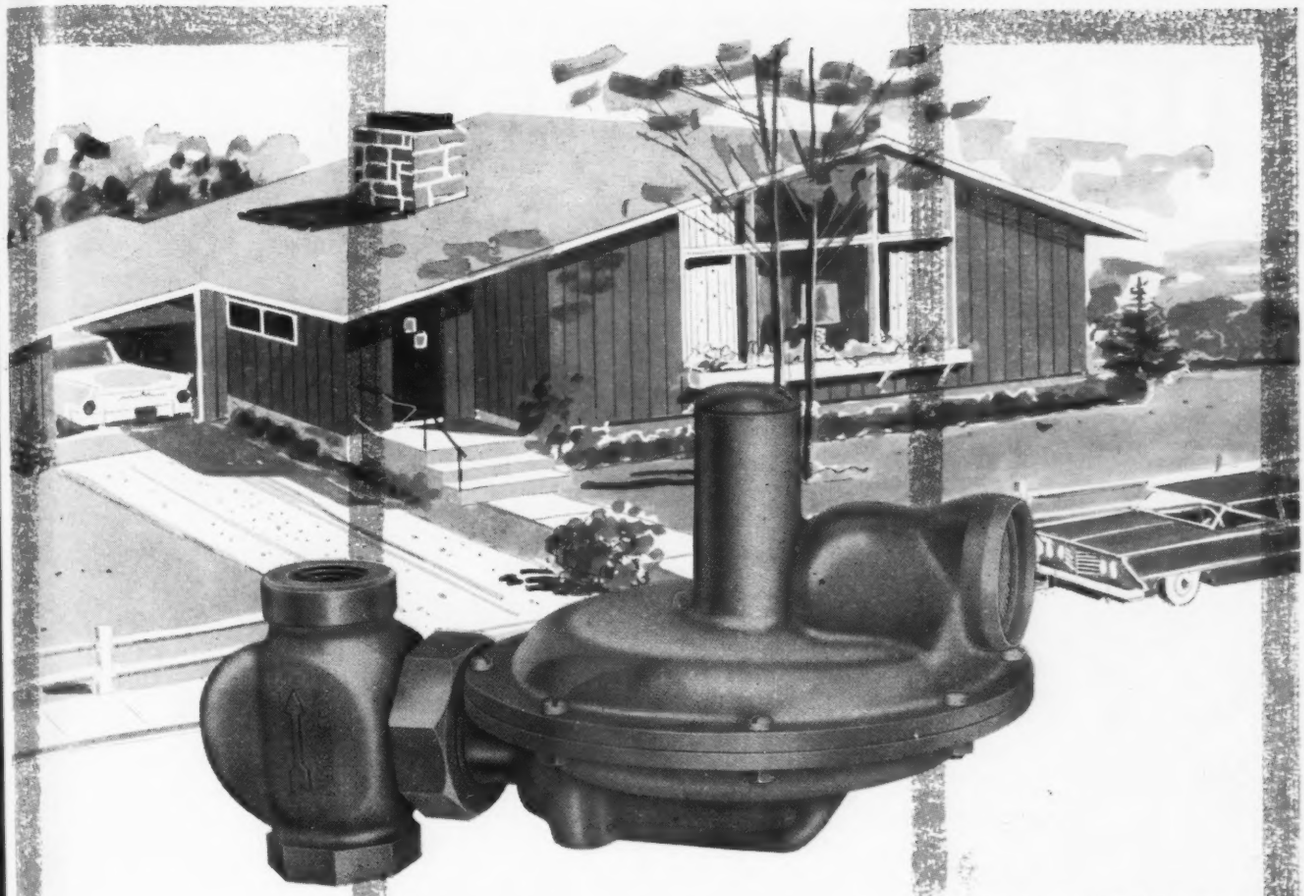
With the separation of the gas and electric properties of Lynn Gas & Electric Co., Harold L. Dalbeck, president of the Gas Division of New England Electric System, has announced the formation of Lynn Gas Co. Separation plan, which became effective on February 5, had previously been approved by appropriate regulatory commission, directors, and stockholders. The separation will not affect service to customers or existing rates but is a step which will more readily permit the merger of the separated gas company into a larger subsidiary of New England Electric System. Officers of the new Lynn Gas Co. are president, Harold L. Dalbeck; vice president and general manager, Richard L. Fite, Jr.; and treasurer, Walter F. Devitt. With the addition of Lynn Gas Co., the Gas Division of the NEES, headquartered at Malden, Massachusetts, now includes eight gas companies in Massachusetts: General Massachusetts Gas, Lawrence Gas, Lynn Gas, Mystic Valley Gas, Northampton Gas, North Shore Gas, Norwood Gas and Wachusett Gas—serving some 240,000 gas customers.

Pennsylvania Gas Association's production conference will be held April 21 at the Drexelbrook Swimming and Tennis Club in suburban Philadelphia. Included on the program are the following papers: "Our Latest Experience in the Production of Thermal Oil Gas" by Clarence B. Glover, United Engineers and Constructors, Inc.; "Protective Paints and Coatings" by Warren Powell, Philadelphia Gas Works Division, U.G.I.; "Emergency Gas Pooling in New England" by a representative of Stone and Webster, Inc.; "The Role of Gas in Meeting Future Energy Demands" by Martin A. Elliott, Director, Institute of Gas Technology, and "Liquefied Petroleum Underground Storage" by Herbert F. Jewson of Philadelphia Electric Company. A field trip is planned to Sun Oil Company's underground cavern being mined by Fenix and Scisson at Chester, Pennsylvania.

Arkla Air Conditioning Corporation plans 8 service training schools on its Sun Valley gas air conditioning units, 3 on its water chiller equipment, and several product and sales schools on each during the remainder of 1960. The Sun Valley and chiller service courses will be held at Arkla's Evansville, Indiana, factory, while the product and sales school will be conducted at company's sales office in Little Rock, Arkansas. Schools will range in length from 3 to 5 days. Schedule of Sun Valley equipment service training schools is: April 4-8; April 25-29; May 16-20; Sept. 26-30; Oct. 10-14; Oct. 31-Nov. 4; Nov. 14-18, and Dec. 12-16. Water chiller schools will be held May 2-6, Oct. 17-21, and Dec. 5-9. Sun Valley product and sales schools are scheduled for April 11-14, May 23-27, and Dec. 12-16. Similar sessions on water chiller will be conducted May 9-11 and Nov. 7-9.

International Harvester Co. plans to acquire Solar Aircraft Co. through an exchange of one share of its common for each 2¼ shares of Solar. "Our present plans call for Solar Aircraft to maintain its corporate identity, operating as a subsidiary company," Frank W. Jenks, Harvester president, said. The parent company, he noted, is "especially interested" in the gas turbine engines developed and produced by the San Diego concern, and in Solar's progress in metallurgy, coatings, electronics, and manufacturing techniques.

Gas lights in the courtyard — Eight gas lamps installed at 1822-38 West 107th Street, represent one of the first multiple apartment building installations in Chicago of this new type of outdoor lighting. The recently completed apartment building, owned by Robert J. Hill, is also equipped with built-in gas ovens and surface burners in each apartment unit, and utilizes automatic gas water heaters and gas clothes dryers.



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Reliance Full Relief Regulators provide maximum safety under the most severe conditions. Full capacity internal relief valve prevents dangerous downstream pressure – even if regulator fails wide open. Compact, light weight, easy to install. Rugged construction for years of trouble-free service.

- Internal relief valve vents full capacity—assures fast emergency release of gas.
- Extra large, weather- and bug-proof screened vent prevents freeze-ups and excludes foreign matter.
- Union-type, removable pipe section simplifies installation—full 360° rotation of diaphragm section gives complete piping flexibility.
- Maximum inlet pressure 125 psi — outlet pressure from 3 to 14 inches w.c. Meets all requirements of ASA B 31.1.8 Code.
- Request Bulletin 102 for full details on Model 1413-B Regulator.

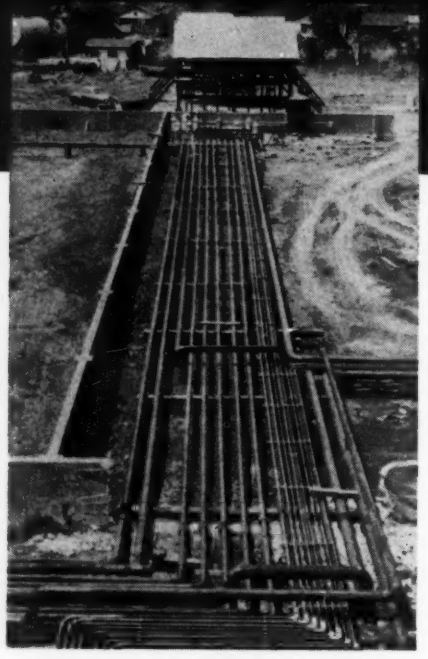
AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Philadelphia 16, Penna. • Albany Atlanta • Baltimore • Birmingham • Boston • Chicago • Dallas Denver • Houston • Kansas City • Los Angeles • Minneapolis New York • Omaha • Pittsburgh • San Francisco • Seattle Tulsa • Wynnewood

IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario Calgary • Edmonton • Montreal • Regina • Vancouver

SUPPLIERS TO THE GAS INDUSTRY for Ironcase • Tinned Steelcase • Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

QUALITY PIPELINES



Another fine service of *LATEX* is the construction of MARINE & PIPELINE TERMINALS. *LATEX* offers personnel skilled in this phase of the industry.

LATEX QUALITY LINE CONSTRUCTION

LATEX offers line construction of the highest caliber. This statement is backed up by more than one quarter century service to the oil and gas industry. Repeating Business has been the keynote to success of this growing company. For your next quality line invite *LATEX*.

REMEMBER, LATEX QUALITY CONSTRUCTION BRINGS REPEAT BUSINESS

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LATEX CONSTRUCTION COMPANY

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Gas Lights At the A.G.A. With an assist from managing director C. S. Stackpole, president Wister H. Ligon of the American Gas Association lights one of two newly-installed Arkla gas lights in the foyer of A.G.A.'s New York headquarters.

"Decade of Competition" is how the American Gas Association's Sales Conference on Industrial and Commercial Gas see the "sizzling sixties." At least, that is the theme of the April 5-7 conference to to be held at the Shamrock Hilton in Houston. Following custom, the 3-day session is divided into an Industrial Gas Day on Tuesday, a general session on Wednesday, and a Commercial Gas Day on Thursday. Highlights of the meeting include presentations on "Economics of Gas Main Extension for Agricultural Use" by L. E. Nelson, Kansas-Nebraska Natural Gas Company; "Appraisal of Future Price Trends of Natural Gas and Competitive Fuels," by Roger L. Conkling of H. Zinder & Associates; "The Facts About Gas and Electric Heat" by J. R. Hammers, Northern Illinois Gas Company, and "The Latest About the Newest" by Raymond G. Juergens, The East Ohio Gas Company.

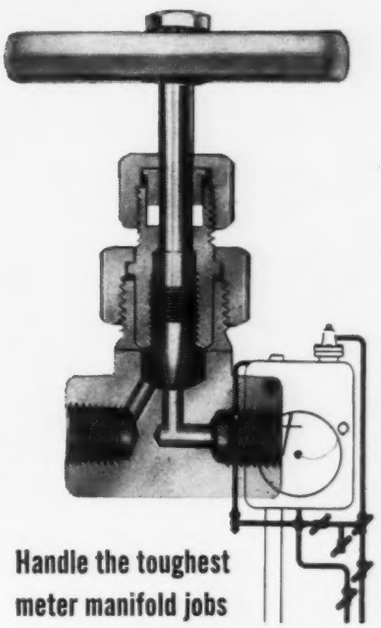
Robertshaw-Fulton Controls Company has purchased the Acragage instrument business of International Register Company, Chicago, and plans to manufacture the line of commercial indicating pressure and vacuum gages at its Fulton Sylphon Division in Knoxville, Tennessee. Acragage products are sold mainly to petroleum, chemical and petrochemical industries, and to original equipment manufacturers and utilities. Annual sales have been at the rate of about $400,000.

A plant for assembly and manufacture of automatic precision control devices for the gas appliance industry in Mexico has been opened by Robershaw-Fulton Mexicana, S.A. de C. V., a subsidiary of Robertshaw-Fulton Controls Company, headquartered in Richmond, Virginia. Russell F. Garner has been named general manager of the new facilities. The plant will be housed in existing buildings in Mexico City's Vallejo industrial zone. More than 10,000 sq ft of manufacturing space is available.

Nearly 107,000,000 gas appliances are now in daily service in homes throughout the United States. The nation's 39,000,000 gas-using families — 30 million served by utility companies and the remainder by LP "bottled" gas — average nearly three appliances each. During 1959, the number of gas appliances in use increased by more than 4,000,000. Largest portion of the gas-fueled home equipment includes heating units of all types. Newest appliance, the gas light, continues to chalk up new records with more than 300,000 units already installed. Other appliances listed by the A.G.A. under "other appliances" in their recent market survey are 27,000 central air conditioning systems.

For dependable field service

SPECIFY AMERICAN® NEEDLE VALVES



Handle the toughest meter manifold jobs and corrosive field services. Eliminate gland leaks.

Teflon-packed forged steel American® Needle Valves deliver year 'round dependable service—stand up under all conditions. Stainless or carbon steel precision machined valve bodies are ideally suited for welding. Stainless steel centerless-ground valve stem design makes it simple to repack valves under pressure.

Standard valves are design rated for pressures to 5,000 psi at 70°F. Upon request, assembled valves are hydrostatically tested to 10,000 psi (twice rated working pressure) and individually inspected. Valves are also furnished with graphite-impregnated asbestos packing for temperatures above 450°F.

Angle or straight patterns—screwed or union bonnets.

Ask your American Meter representative for full details.

AMERICAN® METER COMPANY

General Offices:
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To your 52nd* . . . From our 64th†

Congratulations From Briggs-Weaver and some of the Fine Products They Carry:

RUSTOLEUM — PIPE — GOLDAK
NORDSTROM VALVES — WOOD SHOVELS

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HANDLEY-BROWN *Curb Boxes*

7 WAYS BETTER

1 EASY-TO-LOCATE. *You save time and money* because the built-in magnet and aluminum plate in H-B curb boxes make them easy to find with either magnetic or electronic finders.

2 STRESS-FREE. H-B curb boxes *save you money.* They telescope easily, prevent damage to service stops and piping.

3 LIGHT IN WEIGHT. 7 times lighter than cast iron, H-B curb boxes *save you money* because they are easier to handle. Cut installation time.

4 NON-CORRODING. H-B curb boxes are constructed of a resin-rubber compound*. *You save money* because this material is trouble-free. *It's the same as used in oil field and chemical plant pipelines.*

5 PERMANENT. *You save money* on replacement, because H-B curb boxes are completely permanent . . . remain unharmed by either moisture or soil acids.

6 CUT STORAGE AND HANDLING COSTS. H-B curb boxes *save you money* because they are packed five to a container. They're not only easier and *safer* to handle, but easier to store and stack.

7 FULLY ASSEMBLED. Unpack a container of five H-B curb boxes and *you save money* because they are fully assembled . . . ready for installation.

IT WILL PAY YOU to specify Handley Brown Curb Boxes. Leading gas utilities all over the Country (names on request), are making the switch to H-B after rigorous on-site tests. A representative will be glad to show you the advantages. Write today for information.

End call backs with attractive H-B outside meter boxes. Available as shown, or for recessed installation. Made of tough resin-rubber compound*.

Master Poly-Trol *automatic* gas shut-off valve. Shuts-off gas in event of overpressure, underpressure, excessive high temperature, and flooding. Serves also as a tamper-proof manual shut-off.

Service Test Station. Provides a test station for leak surveys. Permanently installed. Makes random probing unnecessary. Made of tough resin-rubber compound*. Main test station also available.

H-B Cathodic Terminal Box. Landscape engineered, and non-corroding*. Leads are attached to the terminal block in the cap for easy testing.

Roadway Valve Boxes . . . designed to reduce the danger of vehicles damaging valves and gas mains. Constructed of a resin-rubber compound*, they telescope freely. Never rust. Never rot. Weight: only 9 lbs. each.

*A. B. S. Polymer

+Patents applied for

HANDLEY-BROWN CO.

2103 BROOKLYN ROAD • JACKSON, MICHIGAN

"H-B engineering makes the big difference"

you can

relax

with Southern Cross on the job!

Increased distribution profits and improved safety factors are the direct result of leak location control by SCF.

Each year literally billions of cubic feet of gas are accounted for with Vegetation Method, Safety or Combination surveys by Southern Cross. Our completely equipped, system trained repair crews stand ready to repair the leaks found if you desire.

Distribution executives nationwide verify . . . It's real r-e-l-a-x-i-n-g with Southern Cross on the job.

SOUTHERN CROSS
SCF FORESTERS
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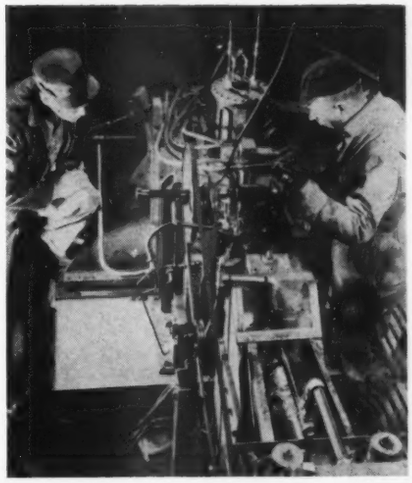
On and Off the Airstrip, Gaslights Guide Flyboys Down Safely. Gas Lights were credited recently with saving the lives of six men and two helicopters caught in a blinding snowstorm near Russellville, Kentucky. It happened in the parking lot of Rockwell Manufacturing Company's Russellville, Kentucky, plant close to midnight. Six Army men flying two military helicopters on a routine flight from Fort Campbell to Fort Knox were caught in a blinding snowstorm about 20 miles south of Russellville.

"It was so thick up there we didn't know where we were," according to Lt. Sam Childs, senior officer and pilot of one of the craft. When they hit the storm the party turned north to Russellville. There they were able to make out only two patches of light, one a large red neon sign on a restaurant, the other the Rockwell parking lot "which was lit up like a landing strip and boy, it sure looked good to us," Lt. Childs said.

Officers revealed they originally believed the parking lot was a temporary landing strip set up for their emergency use by Russellville police. (The pilots had circled the town at a low altitude to attract attention before spotting the parking lot.) Guided by the gas lights, the two 'copters managed to make a landing in an adjacent field after realizing they might hit a car if they landed in the lot itself. "We believe," said Lt. Childs, "that the gas lights saved our lives and the two helicopters."

The 35th annual Southwestern Gas Measurement Short Course to be held April 19-21 at the University of Oklahoma in Norman will feature Wister H. Ligon, president of Nashville Gas Company, and 1960 president of the American Gas Association, as principal speaker. In addition to the more than 89 class sessions both technical and non-technical that will be held at the 3-day short course this year, a number of gas measurement equipment displays will be set up by manufacturers. Educational mass flow gas measurement equipment will be exhibited for the first time.



High frequency, electric resistance welded steel pipe in all sizes from 6 to 16-in. is now being produced by Valley Manufacturing Company, Valley, Nebraska. The new process, of which there are only about 200 installations in the entire world, will increase the pipe capacity of the Valley continuous mills by five times. Electric resistance welded pipe meets standards of the gas distribution industry.

AMERICAN®

AL-175

ALUMINUMCASE METERS

LIGHT WEIGHT AND RUGGED

Precision-built AL-175 Aluminumcase meters are unequalled for dependable, economical domestic service. American's quality features assure maximum accuracy from pilot load to full rated capacity. And these light weight A.G.A. Class 175 meters provide important economies in shipping, handling and setting costs.

- One-piece, die-cast aluminum alloy body.
- 3-Convolution, molded Duramic diaphragms.
- Leakproof grommet-type seals.
- Reinforced flag rods.
- Self-lubricating porous bronze bushings.
- Vented, plastic index box.
- Rated capacity 175 cfh of 0.60 sp. gr. gas at ½-inch w. c. differential. Working pressure 5 psi.

Ask your American representative for Bulletin 305.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)
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NO-OX-ID® 6X joint blocks save time, money, trouble

Dearborn's Pipe Line Primer, NO-OX-ID 6X Joint Blocks and NO-OX-IDIZED Wrapper are an unbeatable combination for long-lasting protection of welded pipe joints.

6X can be used with all types of mill or yard applied coatings ...is cheaper and faster than other joint protection materials.

Available in 8-pound packages, it is easily handled...requires no cumbersome heating equipment...will not coke in the heating kettle...can be reheated without impairment...joint blocks can be added as needed on the job. Workers like it because it is non-toxic, gives off no noxious fumes, causes no chemical burns.

Call a Dearborn representative for additional information on advantages and economies or write for Technical Bulletin giving application methods.

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COMING EVENTS IN THE GAS DISTRIBUTION INDUSTRY

April

5- 7 A.G.A. sales conference on industrial and commercial gas, The Shamrock Hilton, Houston, Texas.

8-9 Florida-Georgia Gas Association, annual convention, Biltmore Hotel, Palm Beach, Florida.

12-13 Ninth Annual Instrumentation Short Course, Los Angeles Harbor Junior College, Wilmington, California. Cosponsored by Southern California Meter Association and Los Angeles Harbor Junior College.

12-14 PIEA-PESA 32nd annual conference and exhibit, Muehlebach Hotel, Kansas City, Missouri.

19-21 Southwestern Gas Measurement Short Course, University of Oklahoma, North Campus, Norman, Oklahoma.

19-21 A.G.A. Research & Utilization Conference, Hotel Carter, Cleveland, Ohio.

21-22 Indiana Gas Association, French Lick-Sheraton Hotel, French Lick, Indiana.

25-27 A.G.A.-EEI National Conference of Electric and Gas Utility Accountants, Roosevelt & Commodore hotels, New York City.

25-27 Southern Gas Association, annual convention, Galveston, Texas.

25-29 American Welding Society, 41st annual convention, Biltmore Hotel, Los Angeles, California.

27-29 NACE Portland Section Corrosion Control Short Course, Portland, Ore.

28-29 Pacific Coast Gas Association Distribution Conference, Benson Hotel, Portland, Oregon.

May

2- 6 PCGA Industrial Gas Sales School, Hotel Sainte Claire, San Jose, California.

9-12 National Restaurant Show, Navy Pier, Chicago, Illinois.

9-12 A.G.A. Commercial Gas Sales School, Edgewater Beach Hotel, Chicago, Illinois.

9-12 ISA instrument-automation conference, San Francisco, California.

9-13 A.G.A. Operating Section Joint Distribution and Transmission Conference, Hotels Roosevelt and Jung, New Orleans, Louisiana.

11-12 Gas Conditioning Institute, National Guard Armory, Liberal, Kansas. Sponsored by the University of Kansas.

12-13 A.G.A. eastern gas sales conference, Statler Hotel, Washington, D. C.

15-17 Wisconsin Utilities Association, accounting conference, Lake Lawn Lodge, Delavan, Wisconsin.

16-18 A.G.A. mid-west regional gas sales conference, Edgewater Beach Hotel, Chicago, Illinois.

16-20 National Fire Protection Association, annual meeting, Montreal, Canada.

22-26 ASME, Oil & Gas Power Conference, Muehlebach Hotel, Kansas City, Missouri.

23-24 A.G.A. Operating Section Production Conference, Hotel Roosevelt, New York, New York.

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OF THE
OIL AND GAS
INDUSTRY

Lone Star Steel men are specialists . . true craftsmen. Lone Star is not just a steel plant *per se* . . but an organization of craftsmen specializing in fine pipe for the great and growing oil and gas industry.

At Lone Star . . with the finest tools and equipment . . steel craftsmen make API casing, tubing, and line pipe to a precise quality level that is well known.

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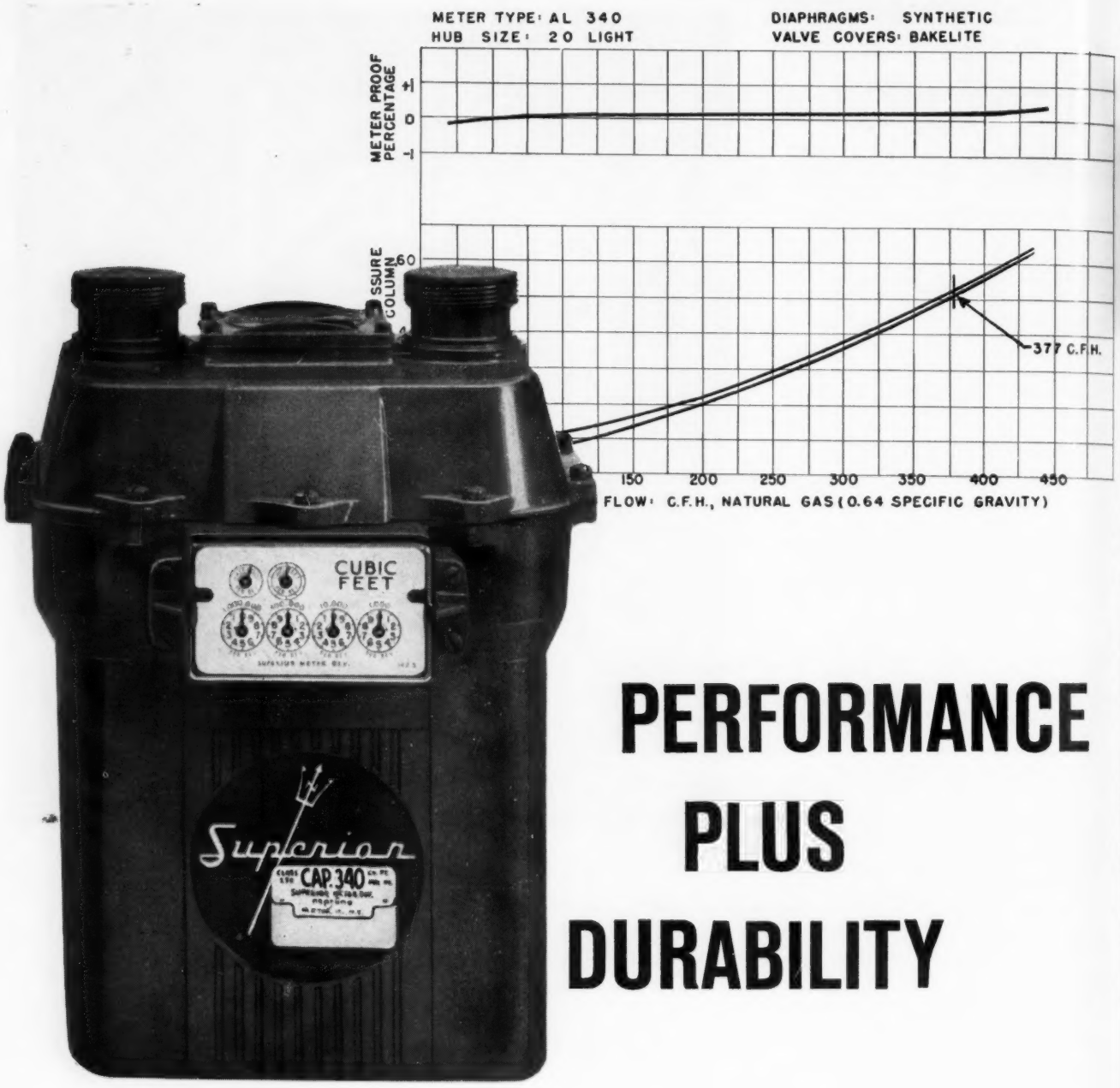

PERFORMANCE PLUS DURABILITY

It's easy to prove the top-notch performance and rugged durability of Superior Aluminum Case Gas Meters on your own test bench.

Look for low differential fluctuation of the water column, and straight-line accuracy on the prover. They are your evidence of smooth performance.

Smooth performance, coupled with Superior's carefully engineered construction, means long-term accuracy. A recent field test has shown no visual evidence of wear in any parts after registration of over 3,500,000 cu. ft.... the equivalent of over 20 years in service.

For complete information on Superior's line of Aluminum Case Gas Meters send for Bulletin 1150... or tell us when a Superior representative may call.

P.S. Nationwide sales, service and warehousing facilities are available on all Superior products, to meet utility metering needs. You can specify "Superior" with confidence.

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MEN AT WORK

IN THE GAS DISTRIBUTION INDUSTRY

D. A. Crawford

R. G. Taber

● **D. A. Crawford,** formerly executive vice president of Atlanta Gas Light Co., has been elected president of the company. He succeeds **R. G. Taber** who has been named to the newly-created position of chairman of the board. The board of directors also elected **W. L. Lee,** vice president to succeed Crawford as executive vice-president and re-elected **C. R. Lawrence,** vice president; **A. R. Hathaway,** treasurer; **J. H. Motz,** secretary, and **W. H. Ryan,** assistant treasurer and assistant secretary.

● Consolidated Edison of New York has elected **J. Eliot McCormack** a vice president. As assistant vice president since 1953, McCormack will have responsibilities for distribution operations. Three other executives have been elected assistant vice presidents: **William C. Beattie,** production; **Dr. William P. Eckes,** medical; **Gordon R. Milne,** engineering. **John D. Gray,** formerly an assistant treasurer, has been elected an assistant secretary.

● **Louis B. Hulcy** has been named general superintendent of Lone Star Gas Co., general division of distribution, at Dallas succeeding **R. E. Reading,** who has been named manager of the rate section of the comptroller's department. **W. H. Ochterbeck** of Waco succeeds Hulcy as chief engineer for the general division at Dallas. **J. E. Gross** of Dallas succeeds Ochterbeck at Waco, and **J. P. Shultz** of Waco takes the place of Gross as distribution engineer.

● North Shore Gas Co. of Waukegan, Illinois, has hired **Art Nepstad,** to the newly-created post of air-conditioning representative to coordinate air conditioning activities for the company, and institute the company's first air-conditioning sales program.

● **Russell V. Rush,** Steubenville, local service manager for Ohio Valley Gas Co., has been promoted to Steubenville district service manager for the company.

● Public Service Electric and Gas Company of Newark, New Jersey, has elected **Charles W. Engelhard** a member of the board succeeding the late Horace K. Corbin who died February 5. Engelhard, who lives at Cragwood, Far Hills, is chairman of the board and president of Engelhard Industries, Inc., a corporation of 17 operating divisions and the world's largest refiner and fabricator of precious metals.

● Philadelphia Electric Company has announced the appointment of **Robert K. Brown** as gas superintendent of its Delaware division succeeding **Lawrence T. Chambers,** who has retired. Brown was formerly senior engineer in gas distribution work at the company's service building in Morton.

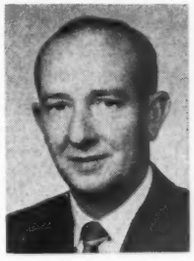
● Philadelphia Gas Works has announced the following personnel changes: **Frank Yarosh,** formerly assistant supervisor customer service department, has been named technical assistant. **Conrad M. Gunther** has moved up to supervisor, gas conditioning at company's production Station "A" succeeding **Tom Barratt** who recently became assistant superintendent. Gunther was formerly assistant supervisor, gas conditioning. **John D. Reed** of public relations, has been promoted to supervisor, customer opinion surveys.

● **Raymond V. Boling** has become manager of the Plymouth Gas Division of the New Bedford Gas and Edison Light Co. He was formerly engineer in the gas distribution department.

● Worcester Gas Light Co. has announced the following recent promotions: **Paul V. Kearney,** superintendent of utilization in the Worcester division, has been promoted to the Hyde Park division as division manager, succeeding **James S. Barry** who retires in 1960. **Stanley V. MacNeill,** superintendent of distribution and utilization in the Marlboro division, has been promoted to the Worcester division as general foreman of distribution. **Donald C. Derrah,** assistant to the distribution engineer in Worcester division, has been promoted to general foreman of distribution of the Marlboro division.

● **Howard A. Lang** of Houston, formerly assistant secretary and treasurer of the Texas distribution division, has been promoted to assistant to the comptroller of United Gas Corp. and subsidiaries at the general offices in Shreveport.

● **Emerson H. Clark** has been promoted from general manager to vice president of Engineering-Construction Co., Tulsa-based pipeline construction firm. He succeeds **Daniel R. Toll,** who will serve as chairman of the company's executive committee.



E. H. Clark

George Crothers

● **George Crothers** has been named vice president and general manager of General Controls Co. (Canadian), Ltd., headquartered in Guelph, Ontario. He was formerly general manager of the Canadian operation which he helped form in 1950. He recently announced the beginning of moving-in operations in the new 40,000 sq ft Guelph plant which will be officially opened in late April. Gas heating controls, as well as a wide line of automatic controls for industrial applications will continue to be produced by the Canadian division in the new facility.

● **G. E. (Ron) Judd,** formerly assistant editor of Chain Store Age, has been named special feature writer on the American Gas Association's public information staff.

J. J. Hart

E. G. Pike

● **John J. Hart,** former research director, has been promoted to chief engineer of Dollinger Corp. of Rochester, New York. Replacing Hart as research director is **E. Grant Pike.**

● **James A. Commander** has joined the special accounting department of Commonwealth Services Inc. where he will work as a consultant in the area of cost accounting. He was formerly with Fairchild Engine & Airplane Corp.

● **Wm. J. Grede** has been elected president of the J. I. Case Co., succeeding **Marc B. Rojtman,** who has assumed the important new position of special advisor to the president and the Case executive committee.

● **W. T. "Tex" Smiley** has been named service manager for General Electric mobile radio at the company's communication products department factory headquarters in Lynchburg, Virginia. He will coordinate GE's "authorized service station" program under which approximately 900 service shops provide technical assistance to GE 2-way radio customers across the nation.

● Heil-Quaker Corp. of Nashville, Tennessee, has announced the appointment of **Oliver Fellows** as district sales manager for Indiana, Ohio, and Kentucky. He will represent the complete Heil line of gas furnaces and gas space heaters.

● **William J. Lord** has moved to General Controls Co.'s headquarters in Glendale, California, as assistant sales manager for the gas heat controls division. He was formerly General Control's eastern region heating controls account executive in New York. He will assist **J. A. Wolff,** divisional sales manager, in sales promotion and marketing activities for the company's wide line of automatic gas heating controls.

● **John Joss,** formerly with the advertising and publications department of Southwestern Industrial Electronics Co., a division of Dresser Industries, Inc., has been appointed administrative assistant to **Leigh Taylor,** SIE's vice president of marketing.

Frank C. Gordon, 63, assistant treasurer of Consolidated Edison Company of New York, died January 14. He began his utility career in 1914 as stenographer for the New York and Queens Electric Light and Power Co., which was later merged with Con Edison. By 1925 he had become treasurer of the Queens company.

John V. Postles, 69, retired vice president in charge of production of The Philadelphia Gas Works, died January 4. He retired in 1952 following 38 years of service with PGW and the United Gas Improvement Company. In 1953, he was awarded the A.G.A. Operating Section's "Award of Merit."

● Equitable Gas Co. has appointed two new assistant superintendents — **John N. Leech** in division "A" and **Robert H. Barrett** in the Gas Measurement division. Formerly Leech has been in Equitable's production and transportation department in West Virginia. Barrett, named measurement engineer in 1954, has held that position until his present appointment.

J. G. Burns

R. J. Karcher

● Michigan Consolidated Gas Company has announced the appointment of **Joseph G. Burns** as assistant general sales manager of the utility, succeeding **Roger J. Karcher,** 43-year-veteran of the company, who is retiring. Burns has held several supervisory posts in Michigan Consolidated's commercial office prior to last June when he was named executive assistant to the vice president and general sales manager.

● **William T. Murphy** has been named staff assistant to **Clarence A. Hubert,** general manager of International Harvester Co.'s construction equipment division. He was formerly staff assistant to **Russell F. Denney,** division's manufacturing manager. **Harry T. Phelps** has been appointed industrial tractor and equipment sales representative; he was previously supervisor of sales promotion, industrial equipment, in the company's consumer relations department.

● Western Kentucky Gas Co. has established an industrial development department and appointed **William H. Neal, Jr.** of Owensboro, to the newly-created position of director of industrial development. The new department will conduct a program seeking to locate new industrial plants within the 60 communities of Kentucky which the utility serves. In addition, a community development program is to be launched under Neal's direction.

● New advertising assistant at Southern Counties Gas Co. is **John A. Mason,** who will assist **Don Robertson,** advertising manager. Mason was formerly with Barker Bros. Corp. **John R. Feehan** has been appointed new business supervisor of Southern Counties' San Gabriel Valley division sales staff, and **Vincent E. Singleton** has been appointed the utility's staff representative, air conditioning, in the Los Angeles office. Feehan was formerly commercial sales representative in Los Angeles.

● **Bohdan G. Passty** has assumed the post of development engineer in charge of the Humphrey heating division of Arkla Air Conditioning Corp.

● **Merrill Ely,** Portland, Oregon, engineer, has joined Honolulu Gas Co. as sales engineer. He was formerly with Northwest Natural Gas Co. as heating engineer.

● Geo. D. Roper Corp. of Kankakee, Illinois, has announced that **John P. Wright** has resigned as president and **Wm. C. Waggoner** has resigned as vice president and treasurer. Both men also resigned as directors of the corporation. **Stanley H. Hobson,** chairman of the board, and **W. G. Vuksnick** were elected president and treasurer respectively. **Harold H. Jeske** continues as executive vice president of the corporation.

● Ohio Fuel Gas Company has announced the following personnel changes: **John W. Cottrill,** Springfield division special representative, has been promoted to Mansfield district special representative. **Frank N. Johnson,** Jackson business promotion representative, has been promoted to a similar post with Ohio Valley Gas Co. in Ironton. **Robert W. McNeil,** Greenfield, has been appointed business promotion representative in Chillicothe. **Alfred D. Wilson,** Fremont, has been promoted to Fremont division accounting supervisor; **John W. Mitro,** Bay Village office accounting supervisor, has been promoted to Norwalk division accounting supervisor, and **William Stoldt,** Fremont, has been promoted to Norwalk district service foreman.

● **John T. Pinkston** has been elected a vice president of United Engineers & Constructors, Inc., Philadelphia. He will retain responsibility as process consultant, the post to which he was appointed when he joined United Engineers in 1959, and will be in charge of all process development activity for the firm. Also, he will be in charge of the firm's activities in the gas industry.

● Thompson-Ramo-Wooldridge Products Co. has established a sales engineering office in Washington headed by southeastern district sales manager **James M. Carolan.** TRW Products, a division of Thompson Ramo Wooldridge Inc., specializes in industrial process control and data handling, and markets systems incorporating the RW-300 digital control computer.

● **Earl A. Erich** has been elected vice president of Tube Turns Plastics, Inc. affiliate of Chemetron Corp., and pioneer manufacturer of injection molded fittings and other piping components of unplasticized polyvinyl chloride. Erich was formerly sales manager of Tube Turns.

● **Arthur P. Jackel** has been appointed consulting engineer in the systems engineering section of the general apparatus department of Union Switch & Signal — Division of Westinghouse Air Brake Co. He was formerly supervisor of system design in the general apparatus department; in his new post he will act as a consulting engineer in applying centralized transport control systems to oil and gas pipelines.

● **Henri V. Precheur** has been promoted from instrument engineer in the general office, gas distribution department, to superintendent of meter stations in the general office of Public Service Electric and Gas Co. of New Jersey. **J. Charles Domnik,** staff assistant in the general office, has been made instrument engineer succeeding Precheur.

● In a realignment of laundry sales functions within the RCA Whirlpool sales department of Whirlpool Corp., **John W. Benson,** assistant national advertising manager since early 1959, is the new sales manager of gas and electric combination washer-dryers. He reports to **Harry Kane,** general manager, laundry division.

J. W. Benson

E. W. Hubert

● Norge Division of Borg-Warner Corporation has announced the appointment of **E. W. (Gene) Hubert** as national sales manager of combination washer-dryers. With headquarters in Chicago, Hubert will direct sales of this home laundry appliance through 87 distributors nationally.

● **Thomas H. Jeffers** has been named director, facilities and tooling, by Robertshaw-Fulton Controls Company. Formerly director of facilities and tooling, West Coast operations, Jeffers will office at Richmond, Virginia.

● M. B. Skinner Co., South Bend, Indiana, manufacturers of pipe repair clamps and saddles, has announced the following new line-up of executive officers: **K. G. Merrill,** chairman of the board, **F. R. McMurray,** president, **H. T. Waite, Jr.,** vice president, sales. Waite, formerly sales manager, has been with the company 25 years.

● **Louis W. Mason** has been appointed general manager of sales of United States Steel's National Tube Division succeeding **Robert E. Williams,** who became vice president of sales for National Tube recently.

● **Douglas K. Ridley** has been appointed by Minneapolis-Honeywell Regulator Co. to a new post as contract sales manager for automatic control equipment produced by its Philadelphia-based Brown Instruments Division and other Industrial Products Group units.

● **Wentworth Smith,** vice president of Neptune Meter Co. and formerly head of the Liquid Meter Division, has been promoted to marketing vice president of the Neptune organization.

● **W. E. Otis,** contract administrator since 1954 has been named contract and marketing administrator by Grayson Controls Division, Robertshaw-Fulton Controls Co.

● Three recent personnel changes at White-Rodgers Co. include: Appointment of **Harold E. Tettambel** as Des Moines district manager; the relocation of **F. J. Maney** from the Des Moines area to become New York district manager where his responsibilities will include supervision of sales covering a large portion of New York, New Jersey, and Connecticut; and the relocation of **Roger P. Coombs** to Indianapolis from Chattanooga.

NEXT STOP... BAY BOTTOM!

American Molox Ball Joint Pipe Specified for Gas Installation

"Our experience with underwater installations caused us to select Cast Iron Pipe . . . AMERICAN Molox Ball Joint pipe," says one distribution engineer for an outstanding West Coast gas utility. The above view shows workmen assembling 10" AMERICAN Molox Ball Joint pipe on board the construction barge, part of a 3,500-foot underwater gas supply line. The 96-foot sections were lowered with the aid of a strongback for assembly beneath the surface.

Specify rugged AMERICAN Molox Ball Joint pipe for river crossings and other difficult underwater installations. Molox pipe affords maximum installation economies because it is easily adapted to several installation methods: It can be floated or pulled across streams, or can be installed directly on the bottom from a barge. Once laid, it remains bottle-tight at any angle. The joint is designed for deflections up to 15°.

Before "plunging" into underwater pipe installations, consider these and many other advantages of AMERICAN Molox Ball Joint pipe. Write for free illustrated catalog.

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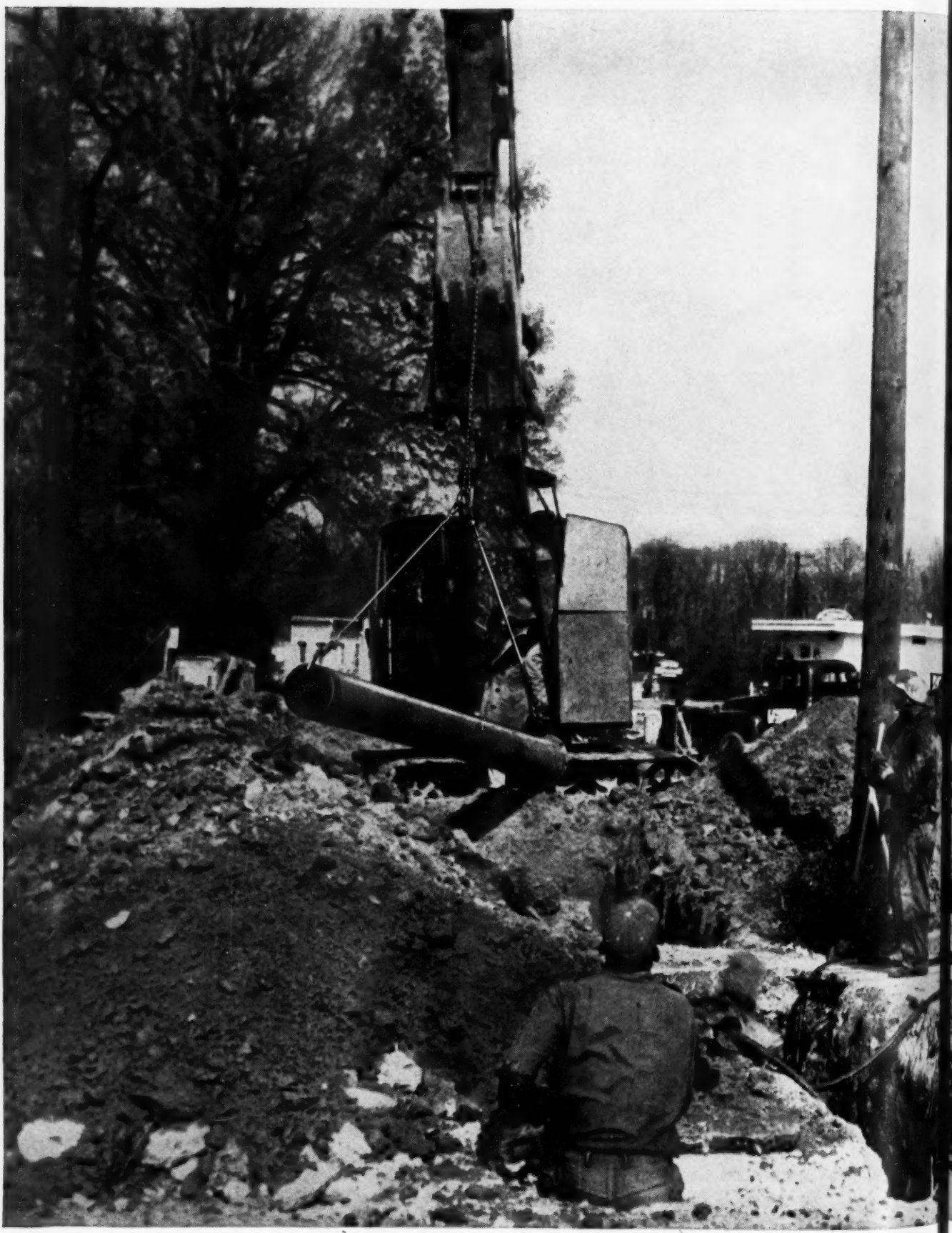

THE MARK OF THE 100-YEAR PIPE

IF YOUR DECISION MUST STAND UP FOR 100 YEARS...

Will your decision today help determine your utility's gas system for the next century? Consider the case for cast iron pipe:

- Sixty-two American cities have had cast iron pipe gas mains in constant service for over a century.
- Rugged, corrosion-resistant cast iron pipe rarely needs repair once it's installed.
- Modern mechanical joints remain tight under normal distribution pressures.
- Cast iron pipe withstands all the usual stresses to which underground pipe is normally subjected.
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Cast iron pipe's ruggedness . . . durability . . . and practically maintenance-free operation make for real savings over the years, too!

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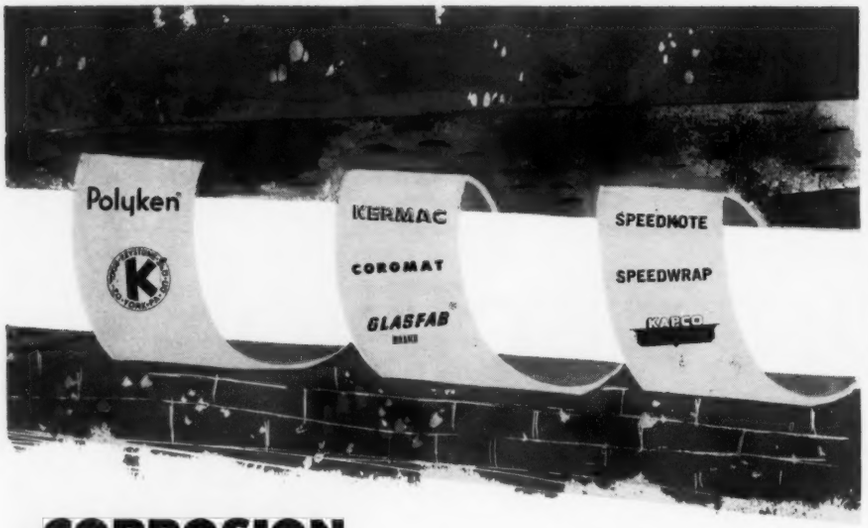
CAST IRON PIPE



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For more than 14 years Midwestern has helped pipeline operators defeat corrosion problems. The Midwestern line offers a complete selection of anti-corrosion products and includes . . . KERMAC outerwrap . . . KEYSTONE asbestos felt . . . KAPCO rock shield . . . COROMAT underground wrap . . . GLASFAB brand handwrap . . . SPEEDWRAP prefabricated pipe joint cover . . . SPEEDKOTE pipe coating . . . and POLYKEN tape coatings.

Midwestern Products and Midwestern Service have proved to be the mark of leadership in the corrosion protection field. Midwestern's representatives are thoroughly grounded in fundamentals and are up to date on the latest developments in both field techniques and new and improved products.

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- Caracas, Venezuela

BOOKSHELF

Principles and Practice of Flow Meter Engineering *by L. K. Spink. Published by The Foxboro Company, Foxboro, Massachusetts. Eighth edition. Pages, 549. Price, $15.*

Written primarily as a text book, new edition covers latest developments in flow measurement and has been enlarged to cover a much broader scope than any previous edition. It covers new primary devices, different tap locations, and touches on the basic principles of secondary elements. Electronic computers have been used to provide many new labor saving tables. An excellent bibliography provides material for study for those who wish to go into some aspect of the subject more deeply.

Summer Air Conditioning *by Seichi Konzo, J. Raymond Carroll, and Harlan D. Bareither. Published by The Industrial Press, 93 Worth Street, New York, New York. Pages, 554. Price, $8.*

A basic what-how-and-why book on residential air conditioning written specifically to provide training text and reference book for all who design, sell, install, or operate air conditioning systems and equipment for houses and small buildings. Book contains problems and exercises for each chapter making the book ideal for both classroom and home study. Simple diagrams show essentials of mechanisms and principles of operation. A full size working psychrometric chart is also provided.

The Punched Card Data Processing Annual, Applications and Reference Guide. *Published by Gille Associates, Inc., 956 Maccabees Building, Detroit 2, Michigan. Pages, 240. Price, $15.*

New reference for users of punched card and punched tape equipment and business computers contains a computer guide that displays all commonly used types of electronic computers with basic descriptions and characteristics. A computer comparison chart gives specifications of each type at a glance. Detailed survey of applications now in use based on more than 2200 questionnaire replies, includes 29 charts showing statistics for all principal functions and types of business. In addition, 45 detailed applications of punched card, tape and computers are classified by types of business and function, such as payroll, sales analysis etc.

Energy for Man, *by Hans Thirring. Published by the Indiana University Press, Bloomington, Indiana. Pages, 409. Price, $6.95.*

A long-range, non-technical survey of the production of energy for man's use and the problems arising from the ever-increasing need for power in our technological civilization. Author discusses major prime movers for power generation and fuel involved. He considers solar energy, atomic energy, and nuclear reactors, thermonuclear reactions, and heat pumps and briefly mentions the wind, tidal, and geothermal power.

Filler Metal Comparison Charts, *2nd edition, prepared by American Welding Society, 33 West 39th Street, New York 18, New York. Pages, 48. Price, $2.50.*

Includes complete set of welding rod and electrode comparison charts; brand names of 78 companies are listed. Fifteen AWS-ASTM specifications are involved and brands as well as manufacturers names are included in two indexes.

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Underground corrosion
steals $600,000,000 a year!*
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It can't rust or rot—is free from electrolytic action—impervious to water and the usual soil elements—highly resistant to most chemicals. Pipe made of KRALASTIC®, the original ABS rubber-resin, never needs coating, lining or anode protection.

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In short, KRALASTIC is a noncorroding pipe material with a combination of properties no other pipe material can match.

Proof of KRALASTIC pipe performance? More than 9,000 miles of KRALASTIC pipe have been specified, installed and are now in trouble-free service carrying potable water, brine, gas, a wide variety of chemicals and even electrical wire and cable. KRALASTIC pipe has been approved by the National Sanitation Foundation and is already accepted in many local plumbing codes.

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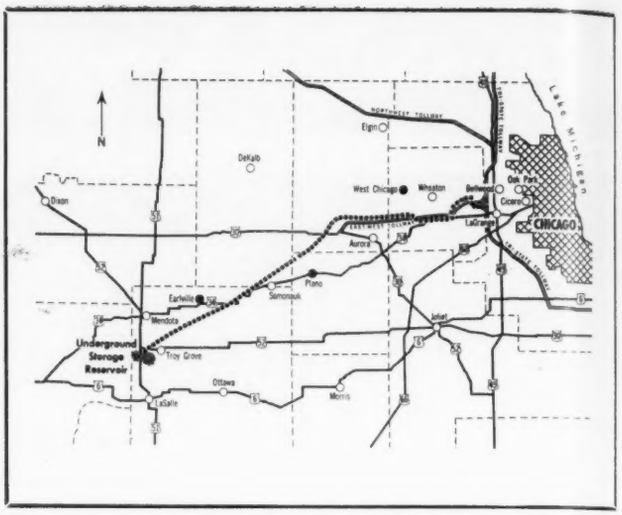
About 35 rail cars, each carrying a dozen lengths of 30-in. steel pipe rolled out of U. S. Steel's National Tube Division works near Pittsburgh, Pa., every day for nearly four weeks loaded with pipe for the new supply line from Troy Grove storage.



Map shows route (dotted lines) of new 30-in. aquifer storage line which will run cross-country to northwest Aurora and then parallel the East-West Tollway to its terminus at 31st Street and Tri State Tollway.

Northern Illinois Gas Slates Storage Line Construction

CONSTRUCTION ON NORTHERN ILLINOIS GAS COMPANY'S new line to transport stored gas from its Troy Grove underground aquifer storage reservoir to the heart of the company's distribution system is slated to get underway early this spring. *(See related story on page 45 this issue.)* The line, staked out in late March, by Williams Brothers Company who engineered the line and will supervise its construction, runs cross-country from Troy Grove (just south of Mendota) to northwest of Aurora and then parallels the East-West Tollway to its terminus at 31st Street and the Tri-State Tollway. Cost is estimated at $10,000,000.

Contract for main line installation is to be let about mid-April. Actual construction will start in early May and is expected to be completed by August. Following thorough testing, line will be put into operation sometime in September.

NI-Gas asked and gained approval from the Illinois Commerce Commission last October of its plans to operate the present underground gas storage structure near Troy Grove as a part of its regular distribution system. Company also gained permission to test and develop the remaining sandstone in a wider area around the present structure. The volume involved in this additional area possibly could increase the total storage capacity of the structure approximately eight times.

Injections of natural gas into the present sandstone structure about 1500 ft below the surface have been in progress since July 1958. On November 1, 1959, total gas injected amounted to more than 3.5 billion cu ft. Company now has approximately 5 billion cu ft in Troy Grove, and by the end of 1960 expects to have up to 10-12 billion cu ft (half usable) in the field. Current plans include construction of a 2000 hp compressor station at the reservoir, drilling of 15 new wells, and installation of a complete gathering system. This will bring total investment in Troy Grove storage facilities to approximately $7,000,000.

Special silencing equipment will be installed to reduce noise at the Randall Road delivery station near North Aurora, and at the terminus at 31st Street and the Tri-State Tollway.

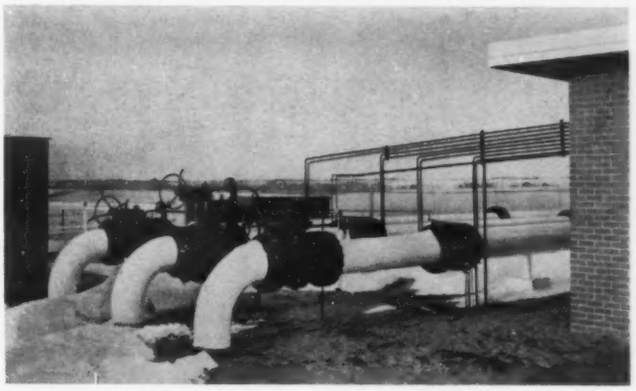
Odorizing facilities will be located at the reservoir so that only odorized natural gas will be transported through the new line.

In charge of the project are George Crossman, advisor, and George Long, project engineer, both of NI-Gas' engineering department.

PIPE DATA

Total number of sections	10,000	
Length of each section	40	feet
Pipe cost per foot	$10	
Weight of each section	2,000	tons
Delivered by rail cars	835	
Area of each stockpile	2	acres

Typical gas purchase point. At Hampden Meter Station, PSCo receives and meters nearly two-thirds of its gas supply for the Denver area; gas is purchased from Colorado Interstate Gas Company.



Three of six parallel meter runs at Hampden. Lines run from orifice taps to Bristol Metameters. These gage lines carry static pressure, gas temperature, and differential pressure.

Installing and Operating the First Computerized Gas Dispatching System

Ray Silkensen, *Chief Dispatcher, Public Service Company of Colorado, Denver, Colorado*

EDITOR'S NOTE: In this article, second of two exclusive AGJ reports, PSCo chief dispatcher Ray Silkensen describes the operations of his department, and the installation of the Libratrol-500, first computerized system to be applied to on-line gas dispatching. Accompanying Mr. Silkensen's report is a step-by-step "guided tour" pictorial report of the new gas dispatching operation. Because installation has just been completed on the computer, it is too early to provide comparative data on performance of the computer system. This will be covered at a later date as the information becomes available.

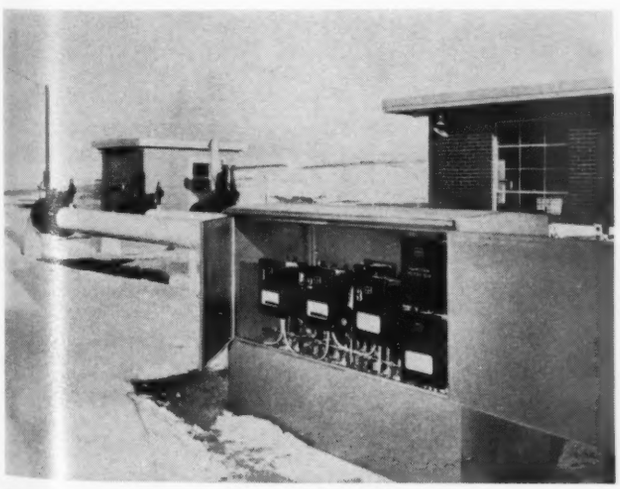
KEEPING MAXIMUM GAS FLOW, as weather permits, within the limits of a pre-established 24-hour peak is the important responsibility of the gas dispatching department of Public Service Company of Colorado. In the Denver area alone, for example, the peak billing demand established during a 24-hour period is currently 305,000,000 cu ft.

In effect, the gas dispatching department must — while keeping its collective eyes on the weather, customer demand, and available gas supply — match supplies and demands.

To do so, it monitors gas deliveries into its Denver system from four different gas purchase measurement stations — Hampden (with 6 meter runs), East 6th Avenue (one run), Arsenal (one run), and North Denver (4 meter runs). Simultaneously, continuous checks are made of gas deliveries to three of PSCo's steam-electric generating stations that use natural gas for fuel—Arapahoe station (1 meter run), Zuni station (one run), and Cherokee (2 runs).

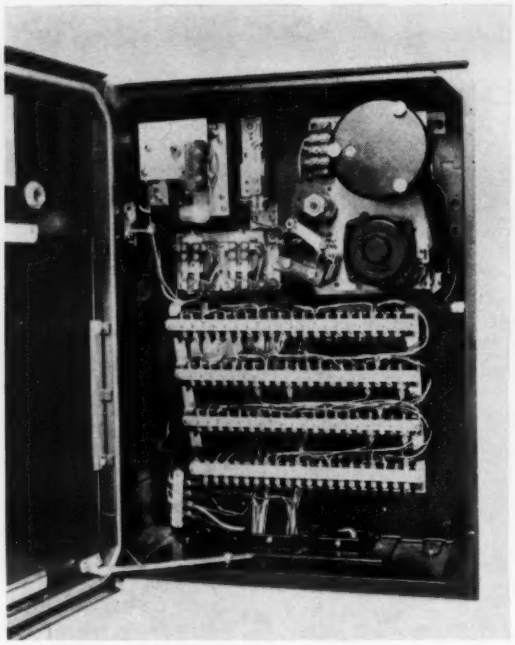
Additionally, the dispatching department checks and calculates flow at delivery points to PSCo's subsidiary companies. At Pueblo, data is taken from two purchase measurement stations (one has one meter run, one has three) where gas is delivered to PSCo's subsidiary, The Pueblo Gas and Fuel Company.

At Cheyenne, data is taken from two purchase measurement stations (one single-run meter station and one

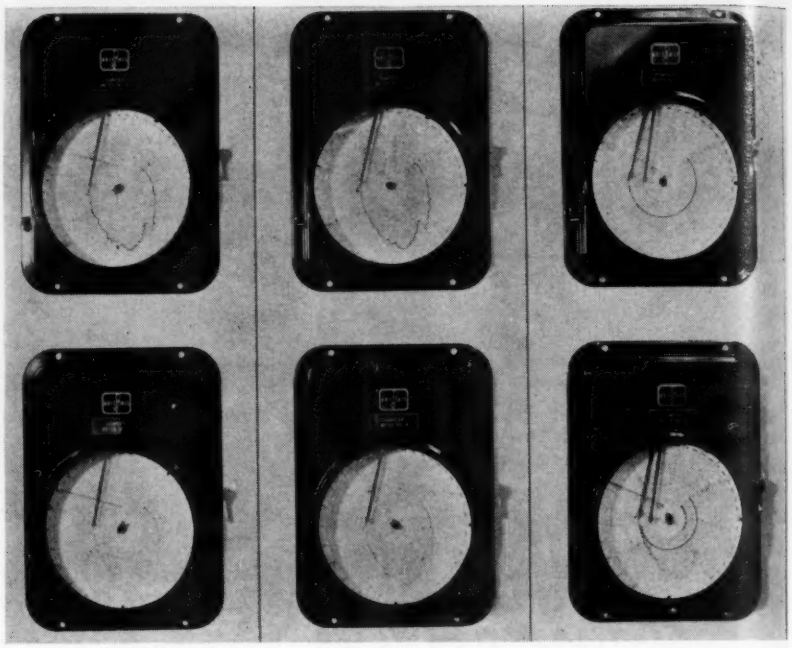


Weather-proof meter housing, showing four of the eight Metameter transmitters.

All eight signals from the station are transmitted over one telemeter phone line, using a multiplex system. Multiplexing has provided considerable saving in leased telephone line charges.



Interior of multiplex receiver on display panel at new gas dispatching center. Signals are separated and sent to respective chart recorders every few seconds.



Six of the Hampden chart recorders at the dispatching center. Previous system involved reading charts each hour and making manual calculation of gas flow. While this work is now done by computer, use of charts is continued as secondary source in event computer service is interrupted.

dual-run station) where gas is delivered to PSCo's subsidiary, Cheyenne Light, Fuel and Power Company.

Three stations are telemetered on the natural gas system of PSCo's transmission subsidiary, Colorado-Wyoming Gas Company — purchase measurement stations at State Line, Greeley, and Mesa.

Also monitored are two metering stations where gas is delivered to large volume industrial customers — at Pueblo and at Cheyenne.

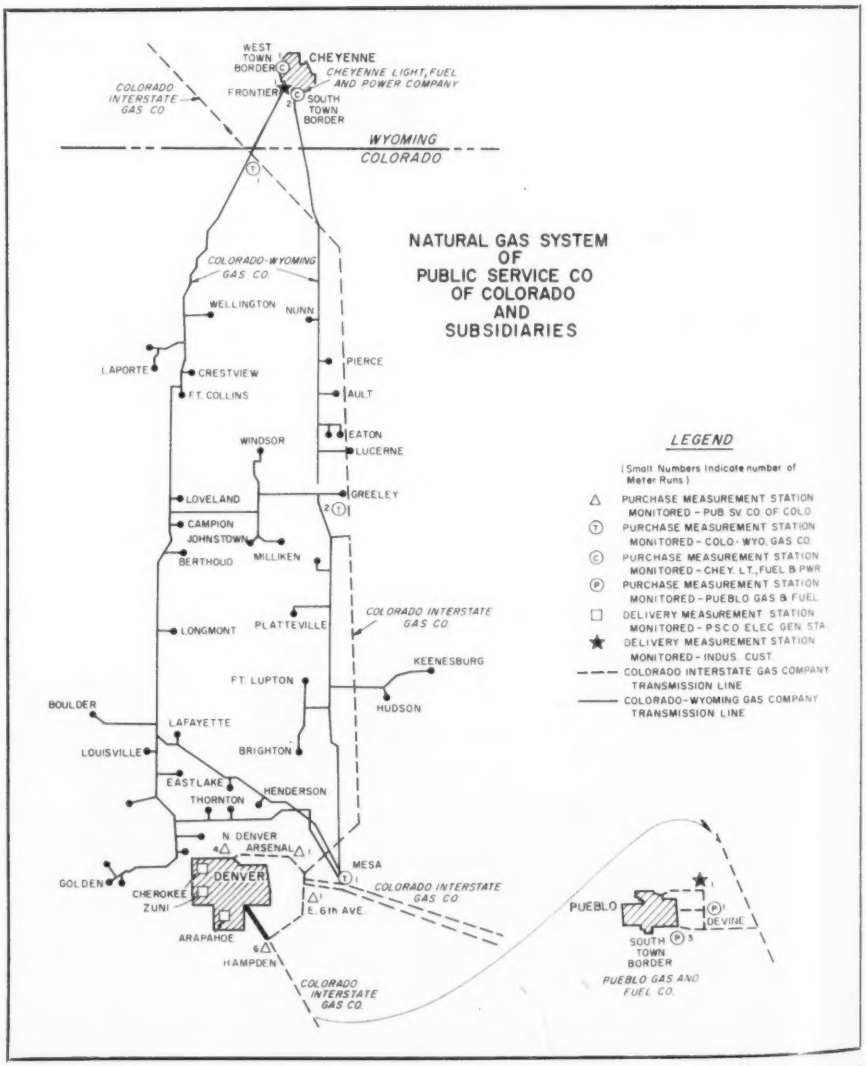
As pointed out in the article in the February 1960 issue of *American Gas Journal* describing the new computerized gas dispatching system at Public Service of Colorado, all 16 of these meter stations—delivery and purchase —are monitored on a 24-hour basis.

Currently, a total of 36 telemeters recording 55 separate values at these 16 points are being monitored.

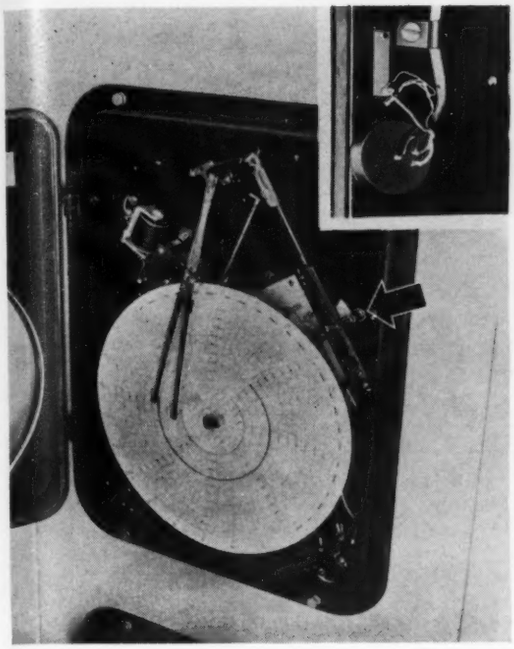
In the past, instruments providing necessary telemetered data were read hourly and flow value at each point computed manually. Under the computerized system, the points are monitored every six minutes — freeing the dispatching personnel to devote more time to the dispatching problems.

(At a future date, two more metering stations at points on another subsidiary company—Western Slope Gas Company — may be added to the computerized system. These stations are at Grand Junction and on the line delivering gas from Piceance Creek field to Rifle.

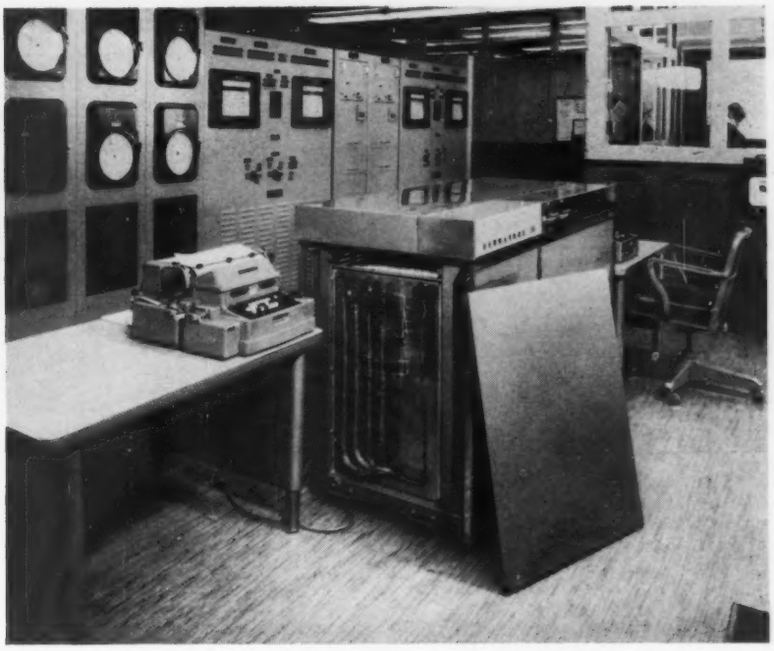
In making hourly telemeter checks and flow calculations for each purchase or delivery point, the dispatching



Map shows location of various measuring stations on the PSCo system and on systems of subsidiary companies that are telemetered from the dispatching center. Readings are taken from 55 different telemeters at the 16 different stations.



Interior of metameter receiver. Arrow shows where gear and potentiometer mounted on back of case (see inset) picks up signal for the computer.



Libratrol-500 in place in new dispatching center. Flexowriter and side panel have been moved to show analog input panel with electrical connections from transducers to computer. (Lines are run under floor from display panel to the machine.)

department maintains control over system demands and the potentially tremendous cost that could occur unless demands can be limited to certain values related to the pre-established peak.

The dispatching department accomplishes this limitation by exercising precontracted service interruptions with large industrial and commercial users.

PSCo's gas dispatching department prides itself on having a competent staff of engineers and dispatchers who, in past years, have been able to accurately determine flow to within one percent of actual billings.

Vast Growth Experienced

Since the introduction of natural gas from the Amarillo fields in 1928, PSCo's service in Denver—and by its subsidiaries in other Colorado and Wyoming areas—has witnessed a gas demand expansion at a constant, yet almost unbelievable rate.

Today, more than 96 percent of the company's residential gas customers utilize natural gas for house heating purposes. In the past 10 years, annual gas sales by PSCo and subsidiaries have increased from 44.5-billion cu ft to 106.6-billion cu ft.

In the Denver district, consisting of Denver and its contiguous areas, reside nearly 75 percent of the gas customers served by PSCo and subsidiaries, and accounts for approximately 81 percent of the total gas revenue of PSCo and subsidiaries.

According to Bruce MacCannon, gas supply superintendent, it is expected that gas demand will increase at least another 50 percent in the next 10 years.

One of PSCo's new major problems, then, is to plan for this continual expansion, based on a constant influx of residential and industrial customers, and a heating season with a mean day temperature of approximately zero.

Computer System Selection

Although acceptable flow calculation accuracy had been realized with manual operation, past growth had already overtaxed the gas dispatching department's manual calculation workload. Future growth trends indicated that a computer of some kind was the only substitute to avoid expanding dispatcher personnel. It was the basic factor of labor costs that provided the prime reason for considering the computer purchase.

In 1959, following extensive study of equipment available, PSCo selected a Libratrol-500 computer for the job because:

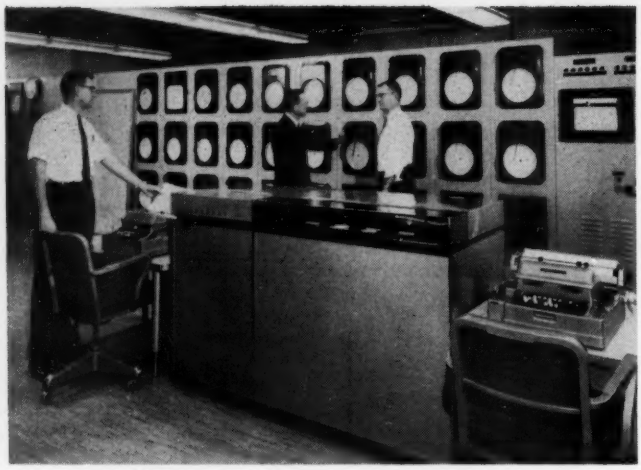
1. It afforded digital computing techniques that were more advanced than techniques supplied by previous systems in use in the gas industry.

2. Its basic computer was a proven system component (based on the LGP-30, a general purpose digital computer designed three years ago by Librascope and in successful operation in hundreds of installations). Of equal consideration was the fact that the Libratrol-500 was designed and manufactured by one of the largest and oldest

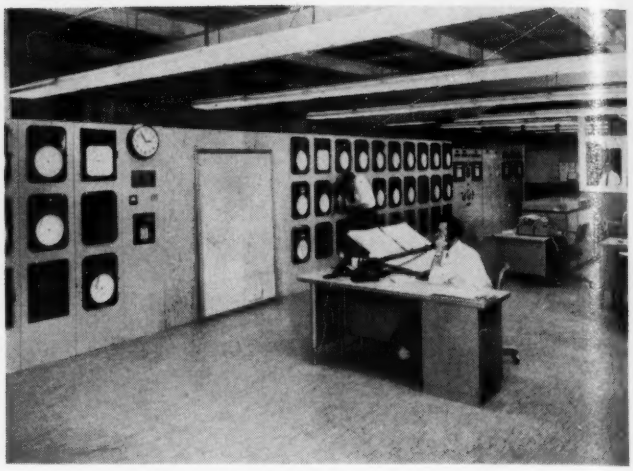
18-02-60
01:00 a.m.

NORTH 4423	HAMPDEN 6052	ARSENAL	6th. AVE. 569	TOTAL 11044	
ARAPAHOE	CHEROKEE	ZUNI 802		TOTAL 802	NET 10242
STATE LINE 780	GREELEY 683	MESA 2401			TOTAL 3864
CHEYENNE STB 263	WTB 276			TOTAL 539	
FRONTIER				TOTAL	NET 539
PUEBLO STB 1664	DEVINE 2478				TOTAL 4142
SO. COLO. POWER 940					

Sample of log sheet as it is printed out by the Flexowriter. Computer is programmed to type both headings and calculation of flow.



Central panel in dispatching center with computer in foreground. Bill Karcher, left, dispatching engineer, reports computer tabulation to Ray Silkensen, center, and Will Neahr for comparison with chart readings. Flexowriter at left is used for on-line input and output; machine at right is used for off-line computations.



Radio communication is an important part of the dispatching operation. Dispatcher Forest Erickson talks with field personnel over radio and learns of storm conditions at a northern station.

computer manufacturers in the country, the Librascope Division of General Precision, Inc.

3. It could easily be programmed to meet specific requirements and it afforded a unique versatility whereby it could "double in brass" as an online dispatching tool as well as provide part-time use as a general purpose computer for other company departments, particularly the distribution, engineering, and measurement departments.

4. The machine was backed by a wide library of available sub-routines and the manufacturer had a competent staff of engineers already familiar with gas industry problems.

Getting Ready for Delivery

Once the decision to purchase, install, and operate the computer system had been made, careful planning and correlation of all operations required for such a system had to be made.

PSCo dispatching personnel prepared a detailed outline of their dispatching calculation procedures and specimen hourly log sheets for the manufacturer. It was decided that the machine should be programmed to type out form headings as well as calculations to allow for changes in format as the system changes in scope.

Two PSCo engineers—Bill Karcher, dispatching, and Will Neahr, gas measurement — were sent to Librascope's Burbank plant for a 30-day training in programming, operation, and maintenance of the Libratrol-500. At this time, initial programming for the system was perfected in a joint effort by PSCo and Librascope engineers.

New Dispatch Center

Expanded quarters were required for the ever-growing gas dispatching center, and a decision was made to relocate the dispatching center prior to the delivery of the computer. This meant moving all of the operations from the downtown Gas and Electric Building to larger quarters at the company's Lipan Service Center.

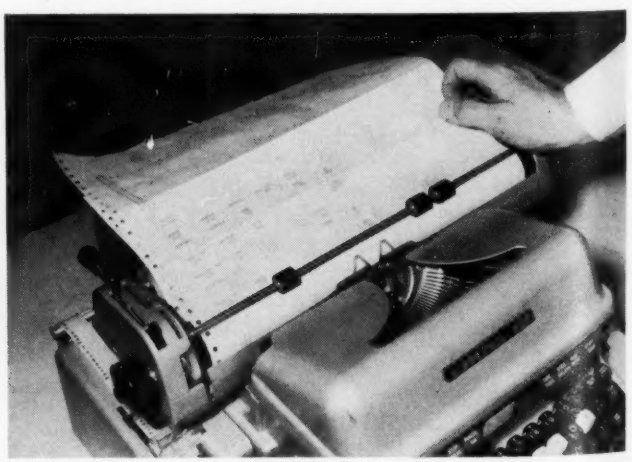
Special preparations were exercised during the move so that not one hourly reading or calculation would be missed during the relocation period. This was accomplished by moving the lines and the chart recorders in sections.

During the time the recorders were disconnected, hourly readings were given to the dispatching center via teletype or two-way radio from the transmission company's dispatchers.

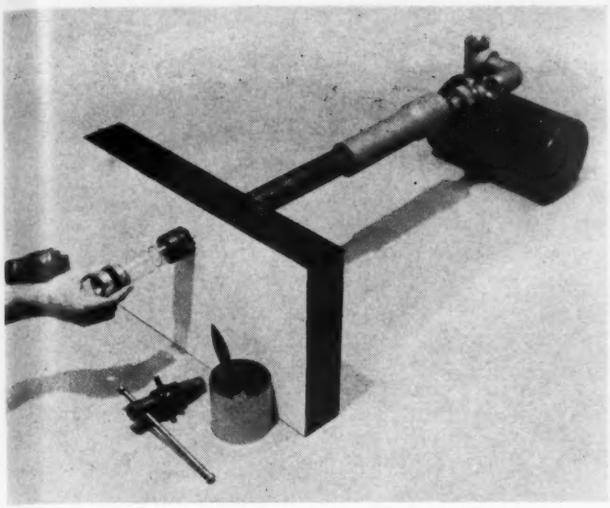
All chart recorders for the largest metering area—Denver—were disconnected, moved, and placed into operation in the new center in one day.

Describing the new Public Service dispatching system incorporating the computer, is best done by graphically depicting the various facets of the operation. The accompanying series of photographs (1 through 12) provide a "guided tour" beginning at a typical remote metering station and following through to the final operation of computing gas flow for billing purposes. *

Will Neahr, gas measurement engineer, checks with gas measurement clerks during monthly computing of gas consumption by industrial customers. This section has been combined with dispatching to form PSCo's new gas measurement and gas load dispatching department.



Typical hourly log coming out of Flexowriter. Computer is programmed to type out both the headings and the computations for each meter station. Computer scans and stores gas load every six minutes and computes the load every hour.



How service head adapter works. Adapter, which makes butyrate pipe service renewals gas-tight and leak-proof, consists of a 3-in. length of transparent tubing sealed to a threaded metal sleeve. Plastic end of adapter is solvent-welded to the butyrate pipe that has been inserted into the corroded service line. Special spanner wrench has lugs that fit into collar on adapter, is used to force collar against a natural rubber gasket that expands to fit tightly against inside diameter of the old metal service pipe. At other end, an outer butyrate sleeve protects service renewal where it is exposed at the main. Old metal service line from house to main acts as protective external sleeve, provides extra margin of structural strength to renewal liner. Adapter, outer sleeve, tubing, and solvent cement are available in a complete gas service renewal kit now commercially available.

At the street main, where corroded service line to be renewed ties-in, the only excavation usually needed is a small bellhole that can be dug quickly by backhoe mounted on small wheel-type tractor. Virtually no retrenching is required, which greatly reduces possibility of damage to lawns and shrubs. Two man crew is shown here with tools and equipment required at bellhole for disconnecting old service, removing short segment of corroded metal service pipe, and for installing the plastic tubing service renewal liner. Tools include wrenches, saw, reamer, pipe cutters, etc. Safety equipment includes mask and fire extinguisher.

Wisconsin Public Service Adopts Plastic Tubing for Service Renewals

Thomas J. Lambeck, *Staff Gas Engineer*
Wisconsin Public Service Corporation
Oshkosh, Wisconsin

WISCONSIN PUBLIC SERVICE CORPORATION has adopted butyrate plastic tubing for renewals of low-pressure gas service lines in its three larger divisions.

The decision was based on the results of an initial trial installation about four years ago that followed reports of the success that Peoples Gas Light and Coke Company of Chicago was having with butyrate renewals. (Peoples now has over 2,500,000 ft installed in such renewals.)

The three WPS divisions — where the butyrate renewals are now standard — serve Sheboygan, Oshkosh, and Green Bay with natural gas. As the two other divisions, Stevens Point (propane-air gas) and Marinette-Menominee (water gas and propane-air gas mixture) are converted to natural gas, it is expected that butyrate tubing will also be authorized for use in renewing corroded metal services in them.

Economics played a major part in our decision.

The butyrate tubing, in 20-ft lengths, costs 13 cents per ft. This price covers both the 1⅜-in. OD and 1⅛-in. OD (both 0.62-in. wall thickness) sizes. In contrast, wrapped steel pipe, 1¼-in. nominal standard, costs 32 cents per ft.

In addition to the material cost savings, we make substantial savings in labor costs. We estimate that a crew of two men can install 2½ to 3 butyrate renewals per day, whereas the same crew can renew only one service per day if steel is used.

There is also a considerable benefit in the retention of customer good will. Virtually no retrenching is required when butyrate renewals are installed; therefore little or no damage is done to lawns and shrubs.

Previously, our service renewals were made by digging up the corroded metal service pipe and replacing it with new coated and wrapped steel lines.

Materials and Methods

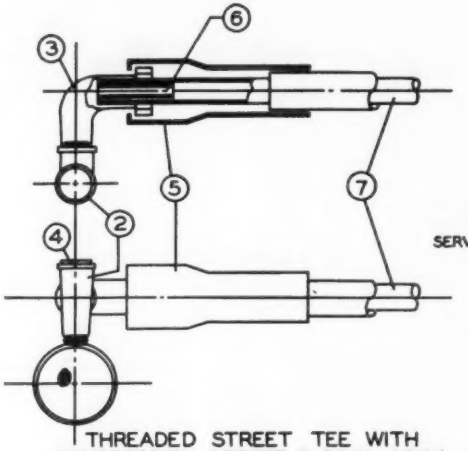
To make the butyrate renewals we use a kit obtained from Perfex Plastics, Inc., Chicago, that consists of a service head adapter; an outer reinforcing

S-105

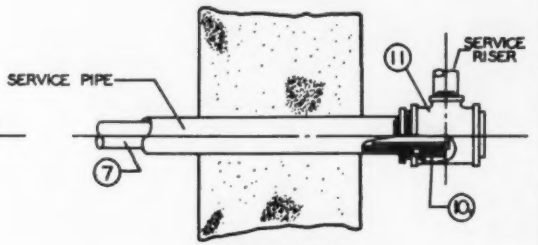
Item No.	Description	Size
	1-1/8" Plastic Tubing in 1¼" Pipe (Lower Complete Assembly)	
1	Brass Street Tee	1" F x 1" M x 1-1/8" OD
4	Brass Plug	1"
5	Perfex #44 Protector Sleeve	
6	Steel Insert Tube	6" long
7	Butyrate Plastic Tubing	1-1/8" OD x 0.062" wall
8	Butyrate Insert Sleeve	8" long
9	#38 Perfex Service Head Adapter	1-1/8" OD to 1¼" IPS
	1-3/8" Plastic Tubing in 1½" Pipe (Lower Complete Assembly)	
1	Brass Street Tee	1¼" F x 1" M x 1-3/8" OD
4	Brass Plug	1¼"
5	Perfex #40 Protector Sleeve	
6	Steel Insert Tube	6" long
7	Butyrate Plastic Tubing	1-3/8" OD x 0.062" wall
8	Butyrate Insert Sleeve	8" long
9	#39 Perfex Service Head Adapter	1-3/8" OD to 1½" IPS
	1-1/8" Plastic Tubing in 1¼" Pipe (Upper Left Assembly)	
2	Brass Street Tee	1¼" F x 1" M x 1¼" F
3	Brass Street Elbow	1¼" M x 1-1/8" OD
4	Brass Plug	1¼"
5	Perfex #44 Protector Sleeve	
6	Steel Insert Tube	6" long
	1-3/8" Plastic Tubing in 1½" Pipe (Upper Left Assembly)	
2	Brass Street Tee	1¼" F x 1" M x 1¼" F
3	Brass Street Elbow	1¼" M x 1-3/8" OD
4	Brass Plug	1¼"
5	Perfex #40 Protector Sleeve	
6	Steel Insert Tube	6" long
	1-1/8" Plastic Tubing in 1¼" Pipe (Upper Right Assembly)	
10	Normac Service Head Adapter	2" M x 1¼" F x 1-1/8" OD
11	Malleable Tee	2" F x 2" F x 1¼" F
	1-3/8" Plastic Tubing in 1½" Pipe (Upper Right Assembly)	
10	Normac Service Head Adapter	2" M x 1½" F x 1-3/8" OD
11	Malleable Tee	2" F x 2" F x 1½" F
	1-1/8" Plastic Tubing in 1½" Pipe (Upper Right Assembly)	
10	Normac Service Head Adapter	2" M x 1½" F x 1-1/8" OD
11	Malleable Tee	2" F x 2" F x 1½" F
	1-1/8" Plastic Tubing in 1½" Pipe (Lower Right Assembly)	
9	Perfex #46 Service Head Adapter	1-1/8" OD to 1½" IPS

NOTE - SEE S-106 FOR PLASTIC SERVICE RENEWAL SCHEDULE

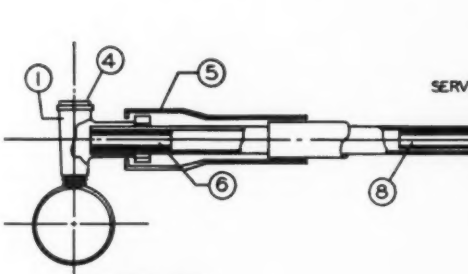
NOTE - USE PERFEX OR NORMAC SERVICE HEAD ADAPTER DEPENDING ON LOCAL CONDITIONS.



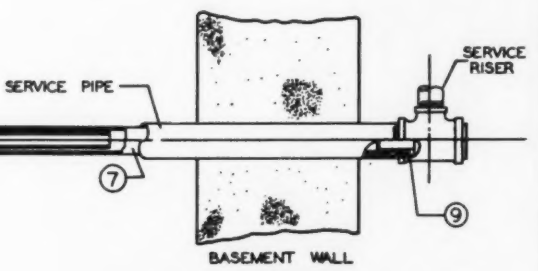
THREADED STREET TEE WITH COMPRESSION STREET ELBOW ASSY.



NORMAC SERVICE HEAD ADAPTER ASSEMBLY



COMPRESSION STREET TEE ASSEMBLY



PERFEX SERVICE HEAD ADAPTER ASSEMBLY

NO.	DATE	REVISIONS	BY

NO.	DATE	REVISIONS	BY
1	9-14-59	GENERAL	DWO

DRAWN BY	D.W.O.
APPR'V'D BY	G.G.E.
DATE	7-14-59
SCALE	———

WISCONSIN PUBLIC SERVICE CORPORATION

STANDARD PLASTIC SERVICE RENEWALS FOR LOW & PRESSURE ELEVATED AREAS FOR MAIN PRESSURES UNDER 5 PSI.

S-105

DESIGN PRODUCTS CO., MILWAUKEE—1020-8 100-8-58

Standards sheet explains diagramatically materials and methods used in making standard plastic service renewals.

Here's How Wisconsin Public Service Makes Plastic Service Renewals . . .

1 **Two-man crew** can make two or three service renewals per day using this method. Renewal is made from inside basement entrance. After plug is removed, a 20-ft length of butyrate pipe is inserted into the corroded metal gas service line.

2 Renewals often run up to 60 ft in length. Additional lengths of the plastic pipe are added as needed, using internal couplings welded to the pipe with a red solvent cement, applied with ordinary paint brush.

sleeve for use where the service line joins the main; butyrate tubing, and butyrate cement for welding the plastics together.

The tubing is supplied in 20-ft lengths that are joined together as needed by internal couplings. As a rule, three lengths are needed for an average installation. The short lengths fit readily on our crew trucks and can be easily handled by one man. If intermediate lengths are needed to finish out a service renewal, the tubing is cut on-site with an ordinary hack saw.

The welds, both for assembling the tubing and for joining the service head adapter to it, are similarly made on-site. The cement is applied with a paint brush and sets rapidly. We use transparent tubing only, and since the cement is red, a visual check of the weld is easy to make.

Special welding crews, as required for metal pipe installation, are not needed for plastics installation. Service crews lose no working time, and street excavations remain open a minimum time.

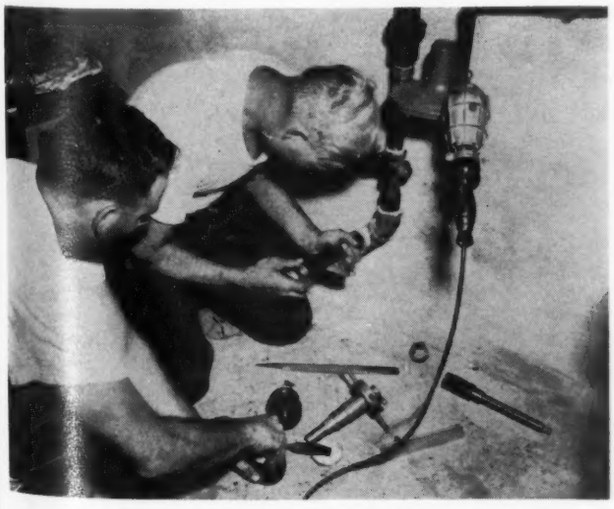
Installation Procedure

Generally, the only digging required is a relatively small trench where the tubing is to be linked to the main. The old metal service remains underground, acting as an external sleeve that provides an extra margin of structural strength.

The butyrate tubing is fed through the old metal service from the basement, after the house pipe has been disconnected. For renewal in old 1½-in. service pipe, we use 1⅜-in. OD tubing; for renewal in old 1¼-in. service pipe, we use 1⅛-in. OD tubing.

At the service head, the plastic end of the Perfex adapter is slipped over the tubing and welded to it.

The adapter consists of approxi-



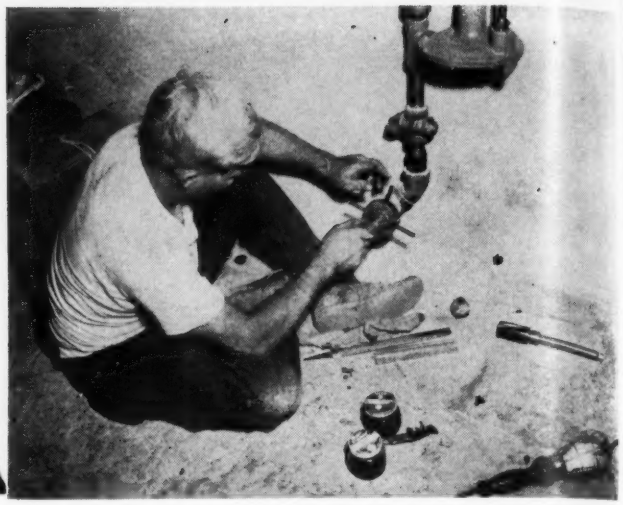
3 As the additional length is added, the weld is checked visually by the crew members. Red cement sets rapidly and use of transparent tubing makes checking of weld easy and accurate.

4 When exact length of tubing is determined, excess pipe is removed with hacksaw.

Standards sheet explains diagramatically materials and methods used in making standard plastic service renewals.

DESIGN PRODUCTS CO., MILWAUKEE—1020-● 100-8-60

5 Service head adapter is then welded to the end of the plastic tubing and allowed to set prior to visual checking of weld.



6 Spanner wrench is used to tighten the natural rubber gasket inside the adapter to produce a gas-tight, leak-proof seal of the renewal line to end of metal pipe.

mately 3-in. of butyrate tubing sealed to a metal sleeve. A special spanner wrench, equipped with lugs that fit into a collar on the adapter, is used to force the collar against a natural rubber gasket. The gasket is expanded to the inside diameter of the old metal service pipe under this pressure, and makes the renewal gas-tight and leak-proof. The existing fitting is then screwed back on the old metal service head.

At the main, a 6-in. tube reinforcement is inserted into the renewal liner. This is then linked to the main using a threaded street tee with compression street elbow assembly. The outer protective butyrate sleeve covers the compression fitting and protects the exposed butyrate where this connection is made.

The service is pressure-tested with air before the gas is turned on again and the trench is back-filled.

At Wisconsin Public Service Corporation, butyrate renewals are connected only to cast iron main systems that operate at low and medium pressure not in excess of 5 psi.

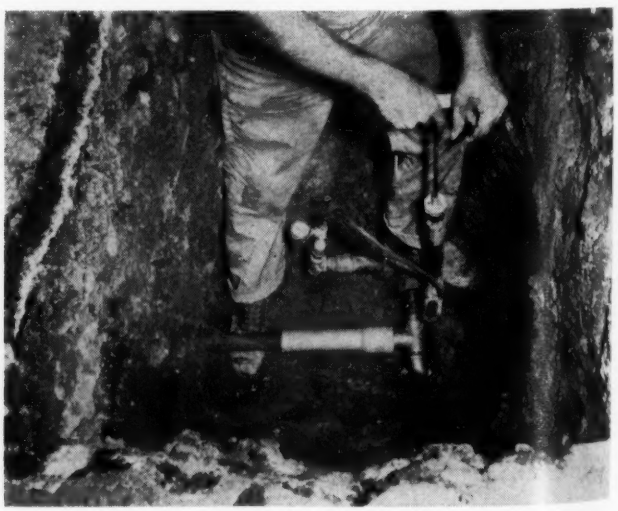
Program to Expand

During 1959, the Sheboygan Division installed 5573 ft of butyrate in both 1⅛ and 1⅜-in. OD, at an average cost of $1.533 per ft. The same division renewed 8202 ft of ¾ and 1¼-in. steel service pipe with wrapped steel pipe at an average cost of $3.258 per ft. Most of the steel renewals were made where pressures were in excess of 5 psi.

Installation of butyrate tubing for service renewals began in May, and an estimated 133 installations were made in the last seven months of 1959. Our average service installation runs 60 ft.

In 1960, we anticipate that we will use between 8000 and 10,000 ft of butyrate tubing for gas service line renewals, and as a result of our present successful experience with butyrate, we are now testing 2-in. standard butyrate pipe for initial service lines. ★ ★ ★

7 At point of connect to main, a 6-in. tube reinforcement is inserted into the renewal liner and this is then linked to the main using a threaded street tee with compression street elbow assembly. An outer protective butyrate sleeve covers the compression fitting and protects the exposed plastic line where connection is made.



8 Renewed service line is pressure tested with air before gas is turned on again. Renewals are connected only to cast iron mains operating at low and medium pressure (not over 5 psi).

REMOTE READING Of Large Industrial Gas Meters BY TELEPHONE

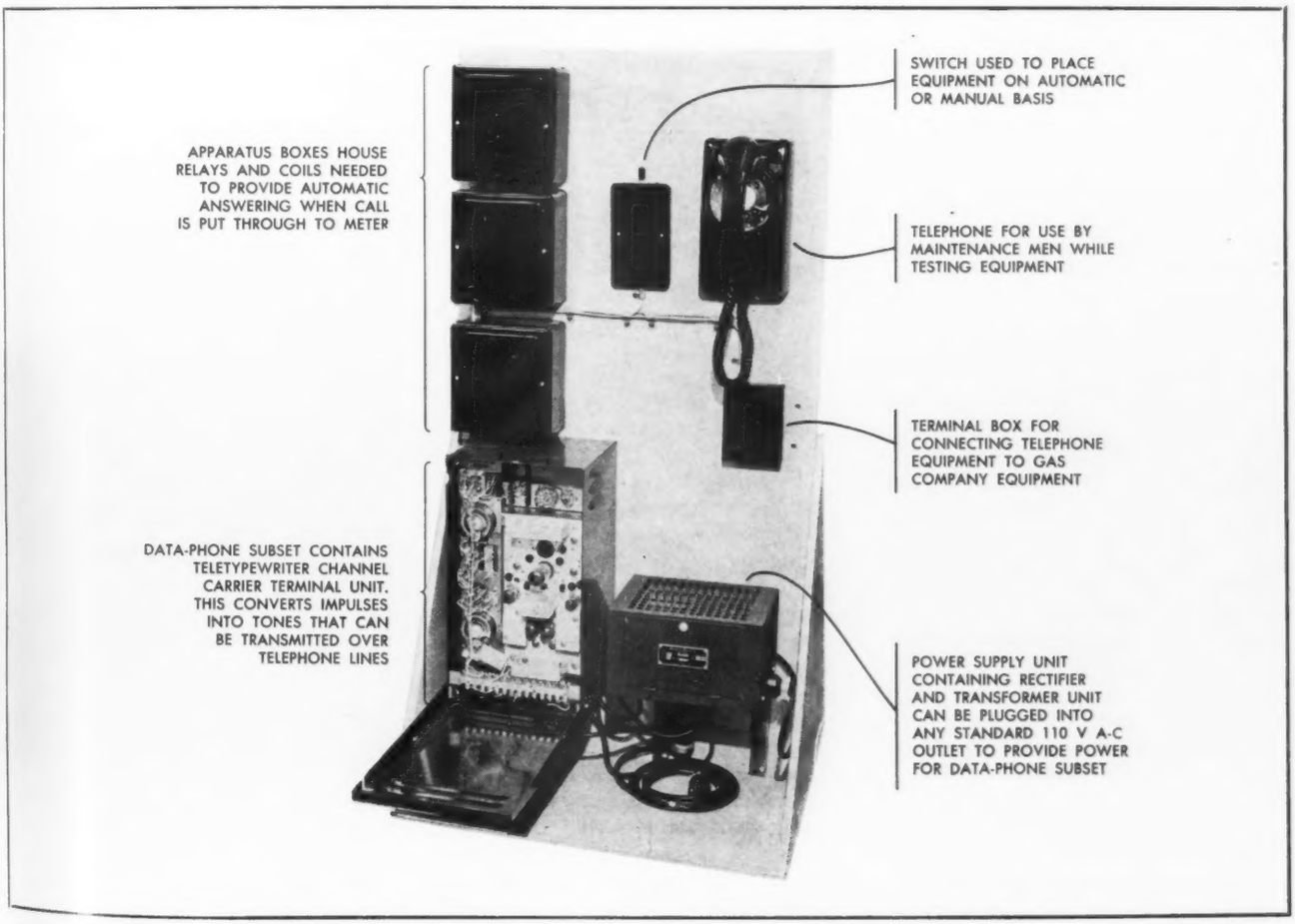
Earl Tornquist, *Director of Research*
Northern Illinois Gas Company, Bellwood, Illinois

REMOTE READING BY TELEPHONE of large industrial gas meters is being studied at Northern Illinois Gas Company on an experimental basis to develop a system for the specific purpose of reading about 60 such large industrial meter installations that have to be read daily, including Saturdays and Sundays.

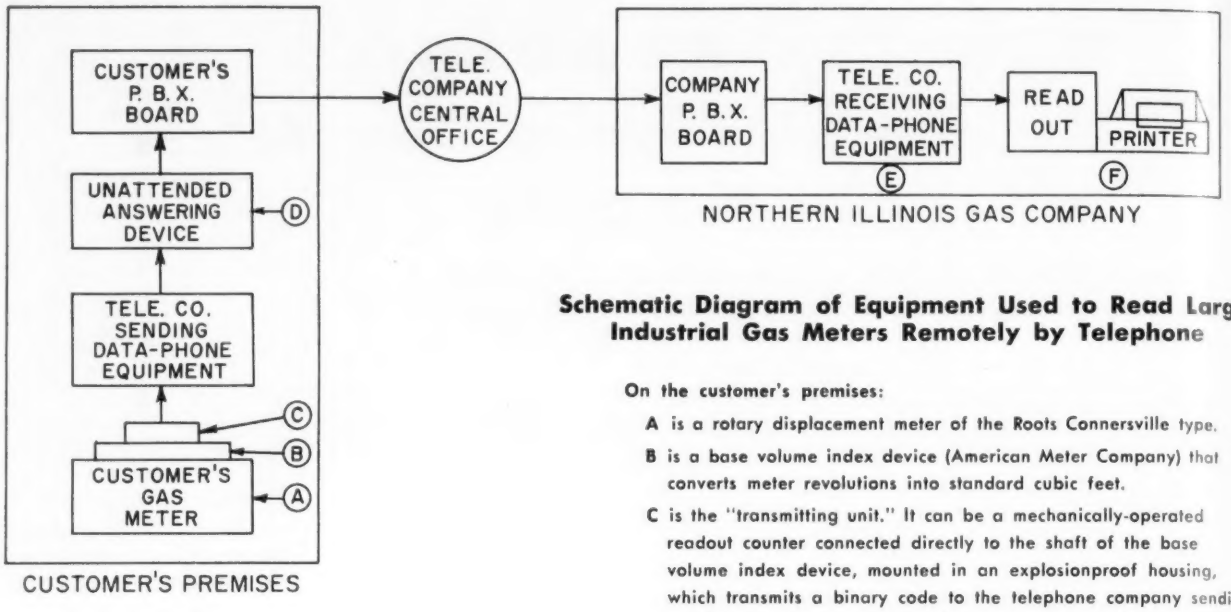
One or more installations are contemplated for early 1960 on a trial basis. At the present stage of development, the system is a rather costly method but shows promise of being economical when applied to the entire group of 60 meter installations.

The system consists essentially of the following:

1. **A transmitter unit** located at the meter installation that accumulates the information from the meter and transmits it to the receiving unit upon request.
2. **A telephone "converter" unit** leased from Illinois Bell Telephone Company that takes the signal from the transmitter and puts it on the telephone circuit as a carrier signal. This equipment is the Bell System's low-speed "Data-Phone" subset, modified for unattended operation, and is considered, for our purposes, as in the experimental stage.
   A similar unit is installed at the receiving station to receive the carrier signals from the various meter locations and deliver them to the receiving unit.
3. **A "readout" unit** at the gas company headquarters that will show a meter registration identical to that on the meter at the time the reading is requested. This can be arranged so as to provide a visual indication, or it can be used in connection with an elec-


APPARATUS BOXES HOUSE RELAYS AND COILS NEEDED TO PROVIDE AUTOMATIC ANSWERING WHEN CALL IS PUT THROUGH TO METER
DATA-PHONE SUBSET CONTAINS TELETYPEWRITER CHANNEL CARRIER TERMINAL UNIT. THIS CONVERTS IMPULSES INTO TONES THAT CAN BE TRANSMITTED OVER TELEPHONE LINES
SWITCH USED TO PLACE EQUIPMENT ON AUTOMATIC OR MANUAL BASIS
TELEPHONE FOR USE BY MAINTENANCE MEN WHILE TESTING EQUIPMENT
TERMINAL BOX FOR CONNECTING TELEPHONE EQUIPMENT TO GAS COMPANY EQUIPMENT
POWER SUPPLY UNIT CONTAINING RECTIFIER AND TRANSFORMER UNIT CAN BE PLUGGED INTO ANY STANDARD 110 V A-C OUTLET TO PROVIDE POWER FOR DATA-PHONE SUBSET

Data-Phone equipment provided by Illinois Bell Telephone Company for use in the remote meter reading system being studied by Northern Illinois Gas Company.



Schematic Diagram of Equipment Used to Read Large Industrial Gas Meters Remotely by Telephone

On the customer's premises:

A is a rotary displacement meter of the Roots Connersville type.

B is a base volume index device (American Meter Company) that converts meter revolutions into standard cubic feet.

C is the "transmitting unit." It can be a mechanically-operated readout counter connected directly to the shaft of the base volume index device, mounted in an explosionproof housing, which transmits a binary code to the telephone company sending equipment upon request. An alternate method would be to use a "Telecount" device (American Meter Company) mounted in an explosionproof housing, which transmits an electrical impulse to a unit located outside that "stores" the information and transmits upon request to the telephone company sending equipment either as a binary code or "pulses."

D is an unattended answer device that, when this number is dialed, connects the telephone company sending equipment to the line and, after transmission of information, disconnects it from the line. In case it is desired to use a telephone at the location, a key is held in the "talk" position during the conversation, which cuts out the telephone company sending equipment.

At the gas company's receiving end:

E is telephone company receiving equipment (Data-Phone subset) that transmits the information received either as a binary code or a pulse to the readout device, when requested, by moving a key into the "readout" position. At all other times, the telephone is in normal operation for voice communications.

F is read-out equipment that converts signal received from Data-Phone subset into printed data.

tric printer (such as a Victor or Clary machine) to type out the information received.

How It Works

In operation, the desired industrial meter location is called (by dialing) over regular telephone exchange facilities. (The meter location is assigned a regular telephone circuit and exchange number.) This can also be done via the customer's switchboard.

When this connection is made, an audible tone is heard by the "caller." He then presses a button and the transmitting unit releases its reading to the receiving unit. As soon as the reading is obtained, another meter can be "called."

Equipment used on the customer's premises and at the gas company headquarters is described in the accompanying diagram.

Other Applications

While the system was developed specifically for the reading of industrial gas meters as mentioned above, it is believed that there are many other applications where it would be desirable to obtain data such as pressure, valve position, or similar information over regular voice communication facilities that are already installed for other purposes.

Experience gained in the tests on reading of industrial gas meters will provide data for evaluating other applications of systems of this type.

Northern Illinois Gas Company is naturally interested in the time when residential meters can be read without visiting the customers' premises and the present studies have provided encouragement in this direction. Discussions to date indicate that an inexpensive transmitting device for residential meters could be developed.

Illinois Bell Telephone Company's engineers believe that a method of transmitting the signal might be developed whereby all the meters in a given telephone exchange could be read rapidly during off-hours without disturbing the customer. A great amount of research will be necessary, however, before the economics of such a system can be evaluated. * * *

The author, Earl Tornquist, director of research for Northern Illinois, demonstrates how a meter is "called" on equipment displayed at recent science fair in Chicago area.

WHAT YOU SHOULD KNOW ABOUT

ELECTRIC HEATING

Robert Morse Wood, *Marketing Consultant*
Ebasco Services, Inc., New York, New York

ONE AMERICAN HOME IN EVERY 100 TODAY IS BEING HEATED ELECTRICALLY, by a heat pump or electric resistance heaters — or a combination of both.

Just 10 years ago, an electrically heated home was little more than a curiosity in many parts of the country. Ten years from now, the electric industry and its allies are predicting one home in 12.

But that's only part of the story. Many thousands of other home owners have been getting accustomed to electric heating by using unit resistance heaters in hard-to-heat corners or rooms, like bathrooms, where extra heat is needed.

Four years ago, six manufacturing companies listed heat pumps in their catalogs; today, there are more than 26. Other manufacturers have been entering the field of electric resistance heating with new models and even new products more rapidly as they see an ever-widening market.

All this means that Americans have begun to believe that keeping warm and comfortable electrically is not only possible — but practical. This has important implications.

Naturally, this rapid growth of electric heating did not start in the colder parts of the country. It started down South and on the West Coast where the heat requirement is less and the cost of heating consequently less significant. But that is not to say that acceptance has remained in warmer climates. *More than one home in seven in Tennessee already has electric heat and, while Tennessee is not a cold region, it has 3000 to 4000 degree days a year.*

In the manufacturing belt stretching from western Pennsylvania through Indiana where winter design temperatures average from 0 to −10 degrees — just about what they do in much of New England — more than 14,000 homes are heated electrically today. One-third of these are in the Michigan-Northern Indiana area where years with 6000 to 6500 degree days are the average, not the exception. There are well over 1000 electrically heated homes in the Detroit area. And it may surprise you to know that there are more than 385 in New England. Each New England state reports at least three homes; a few states, many more.

Why This Change?

There is little doubt that this development represents a change of attitude on the part of many people in the last few years. It was not long ago when even the most dedicated electric utility salesmen would admit — in confidence only, of course — that electric home heating was still impractical. He might cite a reason or two, like "no one manufactured a satisfactory heating device for home use" or "there were no dealers or distributors."

But none of these reasons really rang true or seemed to explain the matter satisfactorily since homes have been heated by heat pumps for more than 30 years and, certainly, electric resistance heaters have been around for many years before that. So why the change? What has made people take another look at and apparently accept electric heating so dramatically?

We should not underestimate the importance of relative price changes in people's minds, of course. The cost of all goods and services has risen sharply in the course of the last decade but electric rates — on the whole — have remained rather stable. Since all costs are relative, electricity seems less expensive. More to the point, costs of competing fuels have risen; in some cases, these increases have been spectacular. This has no doubt been favorable to people's opinion of electric heat.

But two less obvious facts have been at work to help change people's ideas on costs. These are often overlooked but they have had an important influence nevertheless and are worth keeping in mind.

For one thing, practice makes perfect. In electric heating, this adage is certainly true. Methods of estimating heat losses and fuel costs used by heating engineers and contractors over the years built up a wealth of experience to help them in dealing with coal, oil, and gas heating problems. The results they obtained were entirely satisfactory. But when they began using these same methods and experience data in making electric heating estimates, the results indicated high comparative costs. This discouraged electrically heated installations. But, if the builders were not discouraged by these high estimates and the installations were made, actual costs were often only 50 percent or less of the original estimates.

Enough people interested in electric heating became aware of this and began to do something about it. The result was a number of attempts to work out new methods and to gather experience data to help engineers and contractors design jobs calling for less installed kilowatts with safety and assurance. Using this information, they have also been able to prepare operating cost estimates that are far more realistic and competitive. As a result, many more people have been encouraged to go ahead with electric systems and they, in turn, became satisfied customers.

The second fact has been technical advances in and acceptance of insulation by home builders all over the country. Insulation is not a product — like a television aerial — that depends for its sale upon another product. Insulation can be sold on its own merits. It is a great fuel saver, of course. It can usually be shown to pay for itself regardless of the fuel used. But also, among other things, insulation keeps the inside surfaces of rooms at a higher temperature in winter and, since less body heat will radiate to warm walls than cold walls, the physiological effect is obvious. You might sum up advantages like this one under the heading of greater comfort. Assuming the same maintained air temperatures, people are more comfortable in insulated buildings. This principle works as well in summer as it does in winter so the advantages become year-round advantages.

These facts I am sure you will agree with readily, but I believe that the importance to you lies in the fact that improvements to and acceptance of insulation helps electric heating more than it does heating by other fuels. Here is why. Let's say your fuel bill

for a new home you are building, using oil or gas, is estimated to be $200 per year. No insulation is planned. And, without trying to do anything but guess at a round number, let's say that the estimated electric bill to heat the same home electrically (still uninsulated) is $400. The difference is $200. A tidy enough sum to make the average person give careful thought to whether the benefits he imagined for electric heat were worth the cost.

Now let's insulate the house. Let's assume that the insulation which is planned cuts heat losses in half so that the oil or gas bill now becomes about $100 instead of $200. Of course, the electric bill will now become $200 instead of $400. And now the difference is $100. Mathematically, these figures have very little significance. Costs are still related to each other by the same percentages. But who figures his family budget in percentages? Psychologically, there is a big difference. $100 might fit very well into the family budget and leave extra money for other things while $200 would not. I think you can see the importance of this fact.

The reasons mentioned for people changing their minds about electric heating are probably not the only reasons. But they appear to be among the strongest motivators. To sum up — relative price changes have taken place and are still taking place that make electric home heating far more competitive than it ever was before. While these changes have been, on the whole, gradual, awareness and acceptance of the facts has, on the contrary, been rather sudden.

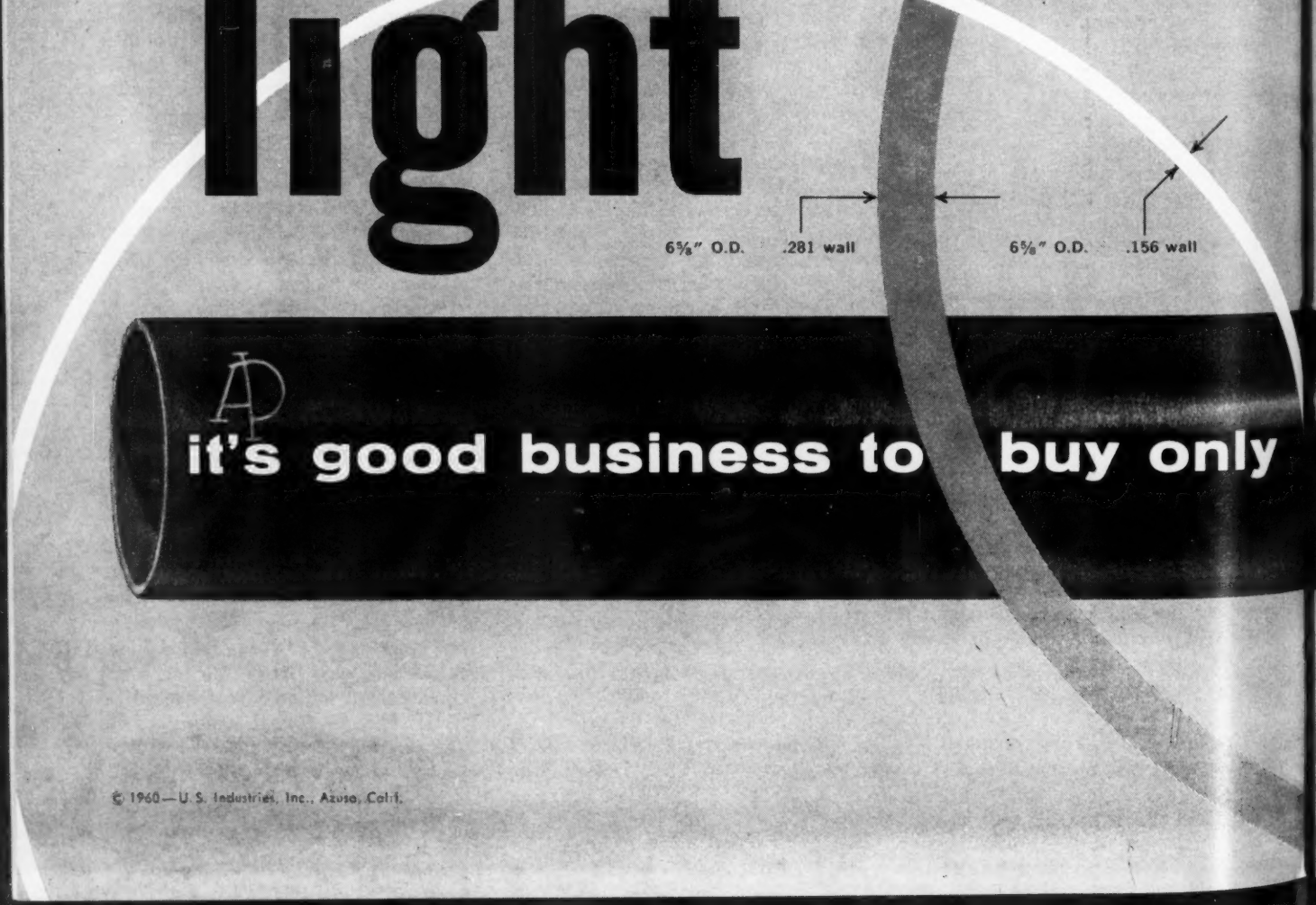
But, to keep this discussion of costs in its proper perspective, let me make the observation that no one that I know of in the electric industry who is promoting residential electric heating today is trying to do so on the basis of costs. At least not the direct costs of fuel by comparison with the costs of other fuels. Electric heating is being promoted on the benefits and advantages which its supporters sincerely believe in on the theory that any additional cost is well worth the price.

Where Do Electric Utilities Stand?

As is to be expected, electric utilities in many parts of the country are finally beginning to take the lead in promoting electric space heating. It might be worth while to look into the reasons why to be sure it is a permanent change of attitude. After all, there is no use preparing for an atomic war if all you're going to have to fight is a street brawl.

Electric utilities face the same problem gas utilities face only it is in reverse. Summer electric demands have been rising out of proportion to demands at other seasons of the year. Evenutally, if not now, this trend will result in lower system load factors and the need for compensating loads. In the southwest, where summer demands are already 130 percent of winter demands, system load factors have been declining since the middle 50's. But let me point out that, in New England, summer demands are rapidly catching up to winter demands. In 1955, they were 88 percent; in 1956, 92 percent; and in 1957, 97 percent of winter demands.

That this trend will continue in New England seems quite likely to most observers at the moment. Supporting reasons are not hard to find. The temperature gets just about as high in cities like New Haven and Boston as it does in Atlanta, Santa Fe, Houston, and Little Rock. Design criteria for air conditioning installations are about the same in all of these cities. There is a way of illustrating this fact. Identical buildings in each of these cities would require about the same capacity of air conditioning equipment. Of course, the equipment in New England would not be used for as many hours each year



as it would in Atlanta or Little Rock, but the demand on the electric system and the need for compensating load would be as great. Here are figures comparing several New England cities with a few so-called "hot" cities:

Design Dry and Wet Bulb Temperatures Wind Velocities and Wind Directions For June, July, August and September.
(From the ASHAE Guide)

	Dry Bulb	Wet Bulb	Wind Velocity	Wind Direction
New Haven	95	75	7.3	S
Boston	92	75	9.2	SW
Providence	93	75	10.0	NW
Manchester	90	73	5.6	NW
Portland	90	73	7.3	S
Burlington	90	73	8.9	S
Atlanta	95	76	7.3	NW
Santa Fe	90	65	6.5	SE
Houston	95	78	7.7	S
Little Rock	95	78	7.0	NE

Shifts in seasonal peaks seem to first show up in the metropolitan areas; even now, summer-peak demands on the electric system in downtown Boston are greater than winter-peak demands. Then, as people become accustomed to air conditioning in the downtown stores, restaurants and offices, they decide it might be nice at home. Soon summer load begins to develop out in the suburbs and gradually spreads until it becomes quite common all over.

There is another fact that electric utilities have become aware of recently. Average residential customer use has risen to more than 3000 kwh per year. Each year, it is becoming increasingly more difficult and expensive to push that average higher because selling efforts are required to replace worn out and obsolete equipment as well as to make new installations even though replacements add no new load. And the fact remains that, even if every electric customer owned and used every electric appliance on the market today, average use per customer would still be in the range of 8000 to 10,000 kwh per year.

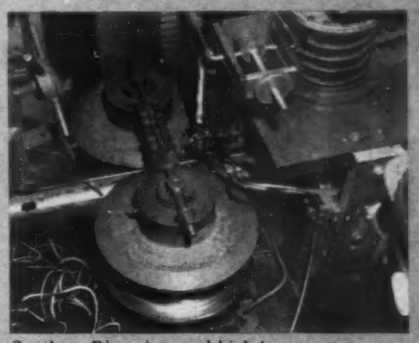
The only load readily imaginable that can help companies climb above this 8000 to 10,000 kwh per customer per year average is electric space heating, and many electric utilities are setting their sights on that load because they feel that the long-range future of their businesses depend upon it. Coupled with this is the belief that, when a customer uses electric heating, any other load is incremental and, thus, easier to sell.

Electric heating and cooling could raise average residential customer use by 20,000 to 25,000 kwh a year (8 to 9 times greater than today's average). And then humidity control becomes a distinct possibility adding 10 to 20 percent more load and making a dis-

specify LITE-WALL save as much as 33%

Approximately $365,000 in pipeline cost was saved by specifying and buying Southern Pipe LITE-WALL pipe. (Company name on request.) The job called for a 147-mile, 6⅝" petroleum products line. LITE-WALL pipe cut cost by more than ⅓.

It's good business to buy only the steel necessary to do the job. In many cases you needn't buy heavy wall pipe, when Southern's LITE-WALL pipe—available from factory stock—will meet your requirements and afford an ample safety factor.



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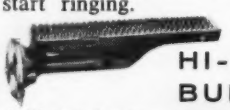

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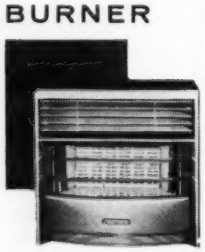


The Dearborn Crest is the world's finest unvented gas area heater, a standard of quality for the heating industry.

Dearborn®

Get details of Dearborn's clean-cut selling policy from any of these regional sales offices: Atlanta, Chicago, Dallas, Los Angeles, San Francisco.

1960 Dearborn Stove Co., Dallas

tinctly favorable (but as yet still unknown) contribution to load factor. All this can be done with electrical products on the market today so there are no development problems involved.

The goal is clear and electric heating is the obvious first step. This all points to the conclusion that electric utilities now in the market are in earnest or, if not now, probably soon will be. *Ideas to the contrary appear to be wishful thinking.*

What About Equipment?

The heat pump has not yet been developed to the point where it is — by itself — a formidable element in the residential market. When summer air-conditioning is not equally as important or necessary as winter heating for comfortable living, then **the heat pump when installed only as a heating device costs 10 to 20 times more than other types of equipment designed for the same job.** Of course, necessities are becoming more a condition of the mind and not of the body so the cost does not necessarily have to drop for this situation to change.

As a heating device, the largest packaged heat pumps today have less heating capacity (exclusive of auxiliary resistance heating coils) than the smallest gas furnaces in common use.

Furthermore, there are technical limitations that make it prudent for manufacturers to improve heat pumps as cooling units that can also supply heat than to boost the heating ratings. As long as these technical difficulties remain and peoples attitudes do not change, the heat pump will continue to blossom mainly in those areas where the incidental heat that can be supplied from a good air conditioning device meets the major requirements for heating.

Electric utilities and equipment manufacturers are giving consideration to the possibilities of improving the capacity and efficiency of the heat pump — and generally trimming operating costs of other types of electric heating — by heat storage methods. Already several companies have offered special rates to attract this kind of business. These rates are economically sound both from the customer's and the company's viewpoint. A major technical advance in this direction will in all probability cause changes in present growth estimates of future business — particularly for heat pumps.

On the other hand, there are as many ways to heat a home electrically as there are acts in a Ringling Brothers Circus. Coils can be installed in the ducts of existing systems. Wires or ribbons can be imbedded in the ceilings, floors, or walls. Radiant heaters can be hung on the walls, built into the walls, fastened flat against the walls. Baseboards can be replaced by electrically heated baseboards. Even wall board and other construction materials can now be coated with conducting material and made to radiate heat from entire surfaces. And this is to mention only a few of the methods.

Most of these devices are best adapted to zone or room-controlled systems, not to central systems. This allows bedrooms to be maintained at one temperature, bathrooms a good deal warmer, and living rooms at still a third temperature. While some zone control has always been possible by carefully designing the sizes of ducts or radiators, controlling each zone thermostatically has been a difficult and expensive task. Electrically, the problem appears to be much less difficult.

Two relatively new devices suggest another alternate method of electric home heating: *The reverse-cycle air conditioner* and *a new product expected to be marketed under the trade name of "Thermoline."* Both are basically heat pumps, but they are window size and have other characteristic features. They are designed in convenient sizes so that by strategically locating them throughout an area they can carry the entire air conditioning load effectively. Then, by maximizing the efficiency — not the capacity — of each unit on the heating cycle, the total cost to heat the area can be reduced substantially. Each unit is individually controlled to produce heat or to cool as its thermostat directs. Since the heat output of the heat pump can be as much as three times as great as the heat equivalent of the kilowatt-hour input, the savings in energy costs when combined with electric resistance heating can become substantial. In addition, this combination permits continuous circulation of air during the heating cycle — something that resistance heating alone does not permit.

Taking into consideration all these electric heating methods and weighing them to decide which of the types will most likely expand most rapidly is difficult to do at this stage of the race. But it seems most likely that the relatively low first cost of resistance heating combined with its ease of installation give it a head start in conversions to electric heating and a decided advantage even in new homes, particularly in those price ranges where air conditioning is not likely. Today, the most popular type of resistance heating seems to be baseboard. Beyond that, I prefer not to hazard even a guess.

Acknowledgment

This article developed from a presentation made to the 1959 New England Gas Association Residential Sales Workshop.

* * *

Installed by NEGEA at Plymouth, Massachusetts

New Standby Plant Features Fully Automatic Control, Constant Btu Content

GAS OPERATIONS of the Plymouth (Massachusetts) Division of the New Bedford Gas and Edison Light Company are not extensive when compared to those of more heavily populated communities, yet Plymouth can now boast of having one of the few high-pressure, fully automatic propane-air gas facilities ever installed in this country. (A sister company in the New England Gas and Electric Association group — Worcester Gas Light Company — has a similar installation at Hudson, Massachusetts.)

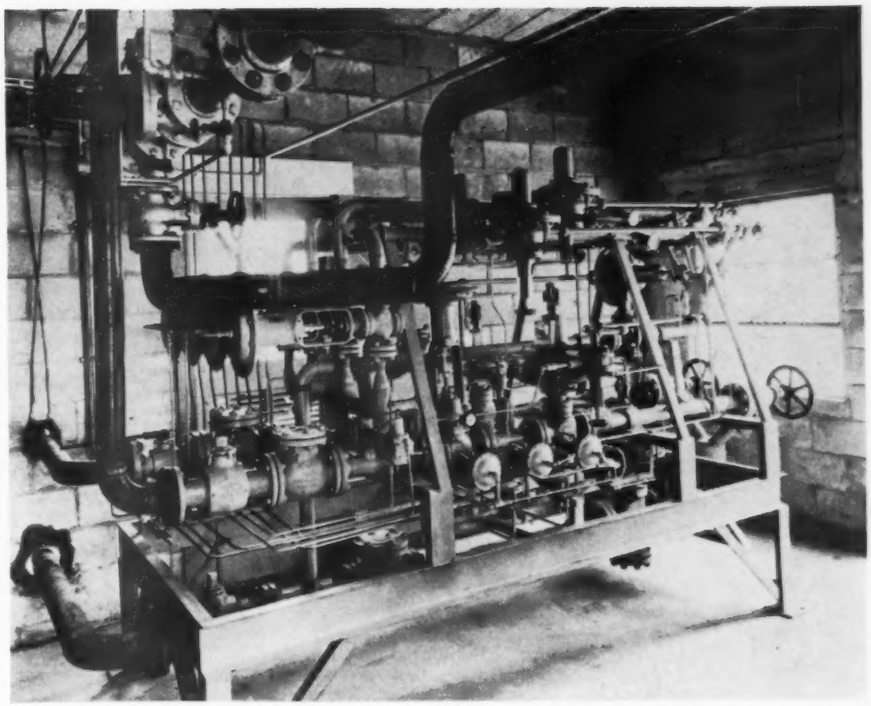
The new Plymouth facility was installed in accordance with NEGEA's policy of providing standby gas facilities for potential emergencies. Once the decision to install the plant had been made in early 1959, the basic requirements were studied by the NEGEA Service Corporation engineering department.

Result of the study was a decision to have a plant that would be as automatic as possible and one designed to insure an uninterrupted supply of high-pressure gas to the town at any time. It was also planned that the standby system should have a maximum capacity to meet the expected growth of Plymouth through 1968.

Contract for design and installation of the required system was negotiated with Applied Engineering Company of Orangeburg, South Carolina, through the firm's New England representatives, Atkinson & Lawrence, Inc., of Natick, Massachusetts.

A number of unique features, previously considered impossible to attain, were designed into the plant and installed as a practical matter. In the event there is any disruption of natural gas coming into Plymouth, the new standby plant, which is normally unattended, will:

1. Start up automatically at any time of day or night and be in full operation within 65 seconds from the time the natural gas pressure drops to a predetermined limit.



Three-stage propane-air mixer unit at Plymouth, Massachusetts. Unit, factory-assembled and pre-tested, is heart of the automatic standby plant system, is capable of very high turn down. Entire mixing of propane vapor and air is accomplished in the unit, with constant Btu control (within a plus or minus 2 percent variation).

2. Automatically adjust itself to the existing gas load — from as low as 1000 cu ft per hour up to 175,000 cu ft per hour.
3. Adjust to the desired Btu content within 30 seconds and maintain that Btu content within plus or minus 2 percent at all times.
4. Hold the correct gas pressure in the entire Plymouth gas system.
5. Upon resumption of natural gas pressure, shut itself down and be ready for another emergency start if required.

Safety and Automatic Control

Equipment in the plant is designed with great emphasis on safety and on automatic control devices as it is located in a normally unattended plant on the outskirts of the town. The plant is inspected daily to ascertain that the equipment is in proper working order.

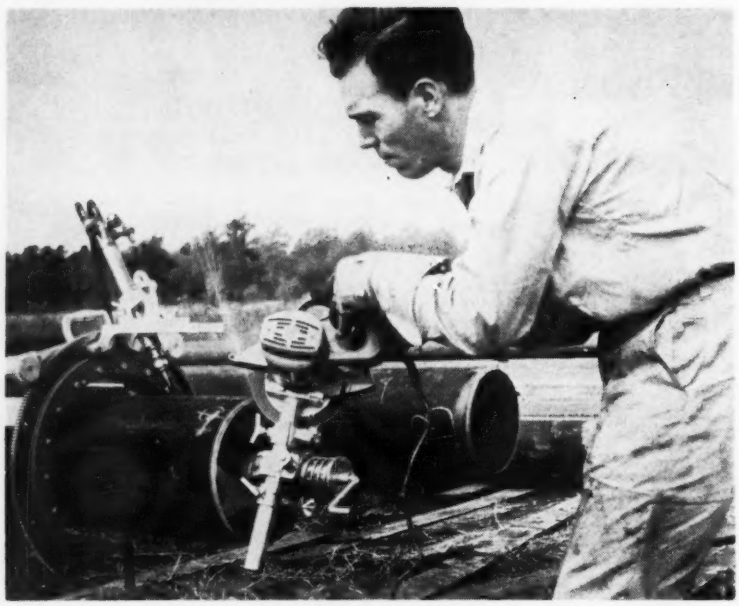
Should any of the vital equipment — which must operate continuously to be ready for instantaneous start — fail to function correctly, an alarm is sounded at the company headquarters. In addition, an alarm is also sounded when the equipment goes into emergency operation so that a man may be dispatched immediately to observe its functioning.

If the automatic controls are not working properly, this man can take over manually by means of a single switch. He would then be in a position to operate the entire system manually and be completely assured of having correct Btu content and exact volume at all times.

The design is one of extreme sim-

Atlas Pipe uses new H&M "BEVEL-LAND" GRINDER

PATENT NO. 2,869,293



to recondition 4000 joints of 10-inch pipe

Atlas Pipe, Inc., of Houston was faced with the problem of reconditioning several ships' cargoes of pipe to be used on the Transwestern pipeline. Most of the pipe had badly dented ends that required severing a 2″ to 4″ strip and placing a new bevel and land on the pipe end. The H&M "BEVEL-LAND" GRINDER was used to clean up the pipe cuts and place a new land on the bevels. The machine eliminated time-consuming handwork and insured better quality welds by accurately placing the land on the bevel.

The new H&M "BEVEL-LAND" GRINDER uses an electric or air powered grinder to clean pipe cuts and place the land on pipe bevels. The GRINDER is available in two models — one for 6-12″ pipe and one for 14-30″ pipe. Larger models are available on request.

WRITE FOR THE NEW H&M CATALOG

which features the complete line of H&M Pipe Cutting and Beveling equipment.

for profitable pipe cutting and beveling
H&M STANDARD MACHINES & ACCESSORIES
The seven models of H&M Pipe Cutting and Beveling Machines are designed to handle 1½″ thru 36″ pipe. H&M Accessories include — the Shape Cutter — Out-of-Round — Motorized Units —Flexible Shaft—Pipe Dollies—Boxes—Clamps.

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plicity that does not require elaborate instrumentation to obtain desired results. The equipment has few moving parts and, in its entirety, is easily and quickly understood by any normally skilled gas service man.

While the standby plant has not been called upon to function in an emergency, it has been completely and thoroughly tested under simulated emergency conditions by deliberately reducing the incoming natural gas pressure, causing the propane-air plant to automatically take over and make gas for the town.

During the simulated emergency tests, no gas customers suffered any loss of service, had any complaints as to operation of ranges or heaters, and were, in fact, not even aware that they were not receiving the usual natural gas through the distribution system.

Propane-Air Mixing System

Principle of the APCO propane-air mixing system is entirely different from the customary propane-air mixing system used in the past.

Rather than try to adjust flow rates of propane vapor and air to produce a desired mixture Btu, which is done by using some type of Btu sensing equipment, this system employs a differential pressure principle where both the propane vapor and the air are each maintained at exactly equal pressures upstream of preset orifices.

After the propane vapor and the air each pass through an orifice, the two are mixed. As the pressures downstream of each orifice are equal due to being common, the pressure drop across each orifice is numerically equal to the other, regardless of flow rate.

Consequently, the ratio of propane vapor to air is always equal and the Btu content of the resultant mix must always remain the same without regard to flow rate.

Basic safety device is a differential pressure switch. As long as the propane vapor and air are within prescribed limits upstream of their orifices, the Btu of the mixture is constant. No complicated instrumentation is needed to obtain positive safety control and exact mixture Btu content.

The APCO principle works just as accurately at 200 psi as it does at 5 psi sendout pressure. It will handle highly variable loads with a high degree of accuracy.

The mixer at Plymouth is a three-stage unit designed specially to handle the extremely wide turn-down range required. It will automatically operate at a sendout from 1 to 170 Mcf per hour. In this way, it can handle either a heavy wintertime heating load or a very small nighttime load in the middle of the summer. * * *

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MEASURE PIPE PROTECTION WITH A CALENDAR

How should pipe protection be measured? By first cost? By ease of application? By appearance?

With all the claims made for protective tapes, too often the most important consideration is overlooked—the simple point of how long and how well it will protect the pipe.

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After all, hot-applied coal tar has proven over the years to be the most dependable and enduring protection. And because TAPECOAT is a hot-applied coal tar coating in tape form, it offers the same lasting protection.

A TAPECOAT sales and service engineer is available at all times to assist you on any corrosion problem and on the various applications of TAPECOAT.

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Pipe	**Tanks**
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TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths—sized to the job. Available also in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

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Why Philadelphia Dealers Sell Gas Appliances

Strong Sales program established with independent appliance dealers by PGW has kept sale of gas appliances well ahead in the Philadelphia market

William H. Stinsman, Jr., *Manager*
Dealer Section, Sales Department
Philadelphia Gas Works
Philadelphia, Pennsylvania

Charlie Batschelet erects attention-getting display on salesfloor of Levin's big store in Philadelphia. Signs and sales messages emphasize advantages of modern gas appliances to hundreds of customers visiting Levin's each day.

PHILADELPHIA'S MAJOR APPLIANCE DEALERS SELL and, in the main, strongly endorse gas appliances. The reason is due largely to the sales policies administered by Philadelphia Gas Works during the past decade. PGW was one of the very first utilities in the country to organize a sales program for independent dealers. While PGW was viewed as something of a pioneer in this type of sales promotional activity back in 1952 and 1953, today most major gas utilities sponsor programs of a similar nature.

Shortly after World War II, the company recognized a significant change in the local major appliance market. The sales of refrigerators, ranges, washing machines, etc., climbed to new highs as people replaced worn equipment and new family units were established. The key factor that forecasted a permanent change in the sales, distribution, and promotion of major appliances occurred with the introduction of television and newly-perfected appliances — such as automatic washing machines, clothes dryers, dishwashers, and room air conditioners.

Sales growth was further stimulated by expanded consumer credit sources as banks and other financial institutions that aggressively encouraged long term major appliance financing. Even the smallest dealers were able to extend the most liberal time payment plans to their customers.

Balance of Power Shifts

In a very short period, hundreds of new appliance dealers began operating throughout the city and established dealers expanded substantially. While PGW remained the largest single retailer of gas appliances, the balance of sales power had very quickly shifted to a point where only one customer in 10 bought gas ranges from PGW; with some variation, the same was true of the other appliances sold by PGW.

The early 1950s found PGW exercising a sales influence in little more than 10 percent of the existing gas appliance market and with virtually no means of counteracting the rising tide of competitive appliance sales. A very serious threat to PGW's domestic load was taking shape. A market survey conducted by the company at that time indicated that, during the six years prior to 1952, the percentage of gas ranges in use compared to the total number of ranges of other types being used by Philadelphia residents had slipped three percent.

It was evident that the steady erosion of PGW's cooking load would accelerate if this competitive saturation continued to grow. The automatic gas clothes dryer, a relatively new gas appliance, was also faring poorly compared to electric dryers. Electric dryers in 1952 accounted for the majority of clothes dryers sold to Philadelphia residents.

PGW special sales representative Amos McDermott, left, talks with James Ledwith of Frank J. Ledwith & Sons in store on Germantown Avenue about PGW's 1959 Fall Gas Range Promotion. Dealers coordinate their own advertising efforts with those of PGW. Range is part of Ledwith's window display. More than 170 dealers in Philadelphia used similar displays during campaign.

In order to measure the effect of the post-war dealer structure with regard to this trend, PGW conducted a survey in 1951 among dealers to determine their sales practices with respect to ranges.

The results of this survey, in a nutshell, were that 31 percent of the dealers preferred to sell gas ranges (because they were cheaper), 24 percent preferred electric and the majority, a whopping 45 percent, left the choice to their customers because they knew of no reason for choosing one or the other.

Imagine this! . . . in a city where 95 percent of the people were cooking on gas ranges.

Reasons for Reorganization

To meet the competitive challenge, it was evident that a more aggressive step-up in PGW's own retail sales operation was not the solution. Such a move would have turned hundreds of Philadelphia dealers away from gas appliances; and in competitive self defense, these dealers would have become ardent sales advocates of electric appliances.

Regardless of our internal success in terms of unit sales of gas appliances, the competitive response of the dealers, numbering approximately 650 at this time, would have perpetuated and strengthened the trend toward electric appliances. PGW's studies of the problem clearly identified dealer sales practices and attitudes as a key element in the future promotion of gas appliances. For this reason, PGW's Dealer Section was enlarged and reorganized in 1952.

For administrative purposes, the city was divided into geographical segments, each containing approximately 100 appliance dealers. The company was determined that every dealer in the city would be contacted regularly by a PGW sales representative, with the frequency of contact fixed at not less than once every seven weeks and, for larger key dealers, not less than once every 10 days. One dealer representative was assigned full-time to the major department stores and larger chain store operations. Another was to work exclusively with plumbing supply wholesale distributors.

Acceptance is Keystone

First job of the PGW dealer representative was to become a familiar and accepted part of every independent dealer's merchandising activity. The personal acceptance of the PGW representative by the dealer and his sales personnel was the keystone on which were to rest the more complex elements of many sales promotion activities.

Fundamentally, the PGW representative became the dealer's manager of gas appliances with special emphasis on product training, advertising, and salesfloor and window displays. To give these activities direction and specific objectives, periodic sales campaigns are sponsored by PGW for various high-quality gas appliances.

PGW's sales philosophy with respect to gas appliance merchandising is based on the fact that, when our customers use top-quality gas appliances in their homes, their attitude toward gas as a fuel is one of high satisfaction. Just as important, gas appliances of better quality provide benefits to the consumer that assure their continued use in the face of attractive sales offers that might tempt our customers to switch to appliances using other fuels. Gas appliances of better quality also require less service, another significant benefit shared by the customer and PGW.

Coordinated Effort Prime Objective

By way of definition, a sales campaign of the type administered by PGW in cooperation with dealers is simply a method for organizing and timing the individual efforts of

PGW department store representative Ken Crouse, right, demonstrates "2-in-1" click-set top burners to prospect on salesfloor of John Wanamaker Company. Department store managers frequently request Ken's expert sales help.

Operation of the "burner with a brain" is explained by PGW's Joe McAllister, right, to four Silo Discount Company salesmen. When this feature was first introduced, PGW dealer representatives used portable kits like one above to demonstrate the new automatic burner to all dealers and their salesmen. Product training is key element in the dealer representative's work.

all the various interests represented in the manufacture, distribution, advertising, and selling of household gas appliances. The complex nature of a large market such as exists in Philadelphia requires the strength of a coordinated effort in order to be effective.

A sales campaign planned well in advance of the actual starting date gives manufacturers and wholesale distributors an opportunity to plan their own individual sales activities, to budget advertising funds, and organize sales promotional efforts.

During an advance preparation period, dealers are fortified with product information and sales pomotional aids developed in cooperation with the PGW representative, wholesale distributor, and manufacturer.

Results That Count

Matchless gas ranges and gas clothes dryers have been the object of PGW's sales campaigns on a regularly scheduled basis for the past eight years. Success of these efforts with respect to Matchless ranges is indicated by the findings of PGW's residential market surveys. These show that since 1952 (7 years) the increase of electric ranges in Philadelphia compared with the total ranges installed was 1.6 percent. This compares with a 3 percent increase during the 6 years prior to 1952.

A Philadelphia Story

The containment of competitive range sales is strictly a "Philadelphia Story" for a check of national sales figures will reveal the continued growth of electric range sales and the loss of gas cooking load customers in other market areas. Significantly, the survey also pointed out that the number of people who "came back" to gas cooking in Philadelphia was growing. During the 12 months prior to July 1959, more than one out of every three electric range users who bought a new range "came back" to gas.

The retention of our cooking customers is important for two reasons: First, it represents a firm year-round load factor of considerable size.

Second, experience has proved that a customer who chooses gas for cooking is most likely to use gas appliances for water heating, refrigeration, clothes drying, and house heating. In essence, the gas range acts as an anchor in securing all the other important uses of gas in the home.

Earlier, this article mentioned another type of survey conducted among dealers to determine their sales attitudes toward gas ranges. This element, too, has improved considerably since the reorganization of PGW's dealer sales promotional activities. The following are the results obtained in surveys, conducted by an outside agency, of dealer sales attitudes.

Dealer Sales Preference Percent of Total Interviewed

	1951	1953	1957
Gas Ranges	31%	90%	96 %
Electric Ranges	24%	3%	1.5%
Neither	45%	7%	2.5%

The degree of success that has marked PGW's efforts with gas clothes dryers is best evidenced by residential installation since 1952.

Total Automatic Clothes Dryers Installed in Philadelphia

Type Fuel	1952	1956	1959
Gas	5748 (44%)	20470 (54%)	36400 (59%)
Electric	7350 (56%)	17260 (46%)	25200 (41%)
Totals	**13,098**	**37,730**	**61,600**

At the present time, more than 70 percent of all clothes dryers being installed in Philadelphia are gas clothes dryers.

The work of PGW's dealer section, which has met with a measurable degree of success, is very much a company team effort. The dealer sales program draws heavily on the services not only of other sections within the sales department but of many throughout the entire company. It is this key element of total service to the dealer and his customers that is our most effective weapon in combating the inroads of competitive fuels. ★ ★ ★

AQUIFERS for Underground Natural Gas Storage

1 | Need for gas storage; types of storage; history of aquifers

Joseph A. Kornfeld, *Natural Gas Consultant, Tulsa, Oklahoma*

THE CHARACTER OF THE MARKET DEMAND CYCLE OF NATURAL GAS requires the industry to furnish substantial additional supplies of natural gas during the winter period of house heating. Peak wintertime demand on the very coldest days to normal load can range anywhere from 2 to 10 times as great as normal load.

In order to meet this heavy seasonal demand, gas distribution companies and gas transmission companies must be able to draw upon large deliverabilities of natural gas available at short distances from the market-demand centers — and have it available upon short notice.

The answer to this supply problem is found in the installation and operation of underground natural gas storage reservoirs selected for their proximity to the principal gas consuming centers — the major cities and metropolitan areas throughout the nation.

Underground storage of natural gas permits the gas distribution companies and gas transmission companies that serve the large population centers to move large quantities of gas during the summer months (when demand for gas is much less) and inject it into the subterranean storage flasks. Then, in the winter when consumer demand is at its peak, the gas is released from storage and placed into the distribution systems, supplementing the volume moving by pipeline from existing fields of natural gas supply.

This mode of operation serves some very useful purposes. It allows the pipeline companies to operate at a higher load factor during the summer months, which in turn helps reduce the distribution companies' cost of gas (when rates are based on load factor and/or demand as well as commodity charges). The distribution company, by using storage gas, can keep its maximum winter "take" from the transmission company within predetermined levels instead of paying a penalty for excess gas demand.

Storage gas, generally, is cheaper than other forms of peak-shaving gas such as LPG-air, oil-gas, etc. Distribution companies utilizing nearby underground storage are also able to level out dispatching operations — withdrawing gas when needed, injecting it as demand drops, even during the heating season.

Types of Storage

Various types of underground natural gas storage facilities include:

1. Abandoned gas fields,
2. Abandoned oil fields,
3. Natural caverns,
4. Artificial (man-made) caverns,
5. Pipe-bottle or pipe-section storage networks,
6. Storage in large-diameter pipeline laterals,
7. Natural aquifers (water-bearing sandstones).

The principal type of underground natural gas storage is an abandoned or depleted gas field located near a market demand center. It is converted to storage service by replugging of old abandoned or shut-down wells and by drilling a sufficient number of new injection, withdrawal, and service wells to enable restoration of the field pressure to essentially the original reservoir value, permitting input-and-output service.

Underground caverns — both natural and man-made — are popular for storage of LPG — principally propane and butane — and are finding application for storage of natural gas.

Buried pipe-bottle storage (or buried pipe-sections) is a method that employs a system of buried pipe sections over a large area into which natural gas is pumped at a pressure of 2240 psig. This pressure was selected because the compressibility of natural gas is near the optimum at that pressure. Pipe-bottle storage finds application primarily where no other form of underground storage exists.

Use of large-diameter pipeline laterals for underground gas storage finds application near a metropolitan area where gas can be "packed" in off-peak hours to meet demands during peak hours such as early morning, noon, and early evening.

Aquifers Gain Importance

Latest type of underground natural gas storage to find widespread application is the *aquifer*, a water-filled sandstone reservoir existing in anticlinal fold.

First major natural gas aquifer storage project expressly designed to augment gas supplies from a major transmission system during peak-load winter demand periods was put into operation in 1953 at Herscher Dome, near the Chicago metropolitan area.

A New Fundamentals Series On Aquifer Storage

EDITOR'S NOTE: This installment is the first in a series of four engineering articles on "Underground Natural Gas Storage in Aquifers" that will be presented each month as a part of AGJ's continuing educational-refresher series on natural gas and gas distribution operations.

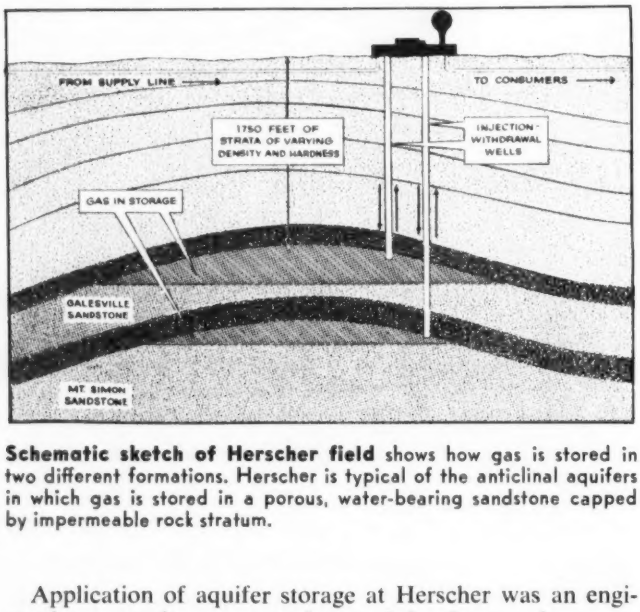
Succeeding installments will cover facets of aquifer storage as follows:

2: *Criteria for selection of aquifers; geology; lithology; economics.*

3: *Drilling, logging, and completion of input, output, and service facility wells.*

4: *Performance data of aquifer-type natural gas storage reservoirs; use of tracers in remedial operations.*

Major aquifers used for underground storage of natural gas are shown on map. Note that all five are located in the north central part of the nation, near large market demand areas.



Schematic sketch of Herscher field shows how gas is stored in two different formations. Herscher is typical of the anticlinal aquifers in which gas is stored in a porous, water-bearing sandstone capped by impermeable rock stratum.

Application of aquifer storage at Herscher was an engineering necessity to meet the need for large volume gas storage for the Chicagoland gas consumers. Chicago is very remote from natural storage facilities such as depleted gas or oil fields. Other methods—such as pipe-bottle storage or additional pipelines for storage—were economically unfeasible.

Engineering History of Aquifers

Storage of natural gas in an underground aquifer antedated the Herscher project by several years.

Louisville Gas and Electric Company has been storing gas at a depth of 650 ft in its Doe Run field on the Kentucky-Indiana border since 1946 in reservoir beds that were formerly filled with water. This operation has been highly successful and gas is withdrawn each winter to meet peak-demand requirements.

Prior engineering history has also been obtained from performance of several depleted gas fields used for storage where water had filled part of the reservoir beds as the original gas was withdrawn. Then, as storage gas was injected, the reservoir water was driven back successfully.

Natural gas had also been injected underground into and stored in water-filled reservoir beds that had not previously contained gas. One of these installations is the East Hastings field in Brazoria and Galveston counties on the Texas Gulf Coast. In this field, Pan-American Petroleum Corporation has injected more than 11-billion cu ft of natural gas that it otherwise would have had to waste or sell at an inadequate price.

Important Storage Aquifers

Herscher Dome. As mentioned previously, Herscher was the first major aquifer to be placed in storage service near a metropolitan market. Its location is about 70 miles southwest of Chicago. The dome, a pronounced anticline of Cambrian sandstones with a structural closure of about 200 ft, centers near the town of Herscher, Illinois, and sprawls over western Kankakee and northern Iroquois counties.

The field is operated by Natural Gas Storage Company of Illinois, a subsidiary of Peoples Gas Light and Coke Company, the major gas distribution company in the Chicagoland area. Natural gas for storage is provided from lines of Natural Gas Pipeline Company of America and Peoples Gulf Coast Natural Gas Pipeline Company, both of which are long distance gas pipeline subsidiaries of Peoples Gas Light and Coke Company.

The *upper* storage aquifer at Herscher is the Galesville sandstones, found at about 1750 ft under a hydrostatic pressure averaging 700 psig. Gas is injected into this reservoir under an average wellhead pressure of about 1000 psig. The Galesville sandstone reservoir now holds more than 31-billion cu ft of gas, of which 15-billion cu ft is cushion gas.

The *lower* storage aquifer is the 2350-ft deep Mt. Simon sandstone, which has a reservoir capacity of 10-billion cu ft of which 8-billion cu ft is cushion gas. It has been under exploration and development since 1958.

During the 1958-59 heating season, Herscher provided a total of 11.4-billion cu ft of gas for delivery for distribution to Peoples and 25 utility-customer companies supplied by Peoples' two subsidiary gas transmission systems.

Redfield. What may be the largest aquifer storage project in the natural gas industry is in operation at Redfield.

About The Author

Joseph A. Kornfeld, natural gas consultant of Tulsa, Oklahoma, has been active in the natural gas field since 1944 in geological, engineering, appraisals, economics, and education. He prepared reserve estimates of natural gas distillate fields as reservoir engineer with Texaco Inc.'s West Texas-New Mexico division during 1944-1948 and with Sohio Petroleum Company at Oklahoma City during 1948-1950.

While with the editorial department of *The Oil and Gas Journal* at Houston and Tulsa, Kornfeld prepared numerous engineering articles on natural gas in exploration areas, production practices, pipeline practices, underground storage, and gas well stimulation. Since 1954, as a consultant, he has prepared appraisals of natural gas reserves throughout the U. S. for pipeline firms and investment firms. In the field of education, he is author of *Natural Gas Economics,* used as a text in engineering courses at Texas A&I College, Kingsville, Texas. Since 1958, he has served as industry lecturer on natural gas storage, methane liquefaction, and economics in the School of Gas Technology, sponsored by the Petroleum Extension Service of the University of Texas. He is listed in the current edition of *Who's Who in the South and Southwest.*

near Des Moines, Iowa. Owned and operated by Northern Natural Gas Company, Redfield has an ultimate reservoir capacity of about 140-billion cu ft and a "working gas" or in-and-out capacity of 40-billion cu ft.

Significance of the project is indicated by the fact that the maximum peak-day withdrawal during the current winter season of 105,000,000 cu ft represents nearly 10 percent of the maximum peak-day send-out of the entire Northern Natural Gas Company system. The aquifer furnished in excess of 10-billion cu ft during the present 1959-1960 heating season (to about March 1, 1960) with withdrawals still underway.

The project consists of two systems arranged as:

Upper System: St. Peter-Elgin sandstones ranging in depth from 1300 to 1700 ft;

Lower System: Mt. Simon sandstone lying at about 2700 ft.

(There is a small percent of gas migrating from the St. Peter sandstone into the Elgin sandstone but reservoir pressures are kept at nearly original values to prevent escape from the structure.)

Maximum wellhead injection pressure is about 850 psig in the St. Peter-Elgin system, and about 1200 psig in the Mt. Simon system.

Bulk of the peak-day withdrawals were furnished by the St. Peter-Elgin system and accounted for from 70,000,000 to 75,000,000 cu ft per day. The deeper Mt. Simon sandstone system furnished from 25,000,000 to 30,000,000 cu ft per day.

Redfield aquifer project is operating under a temporary certificate from the Federal Power Commission covering 25,000,000 cu ft per day. The remainder of the withdrawals comprise test gas.

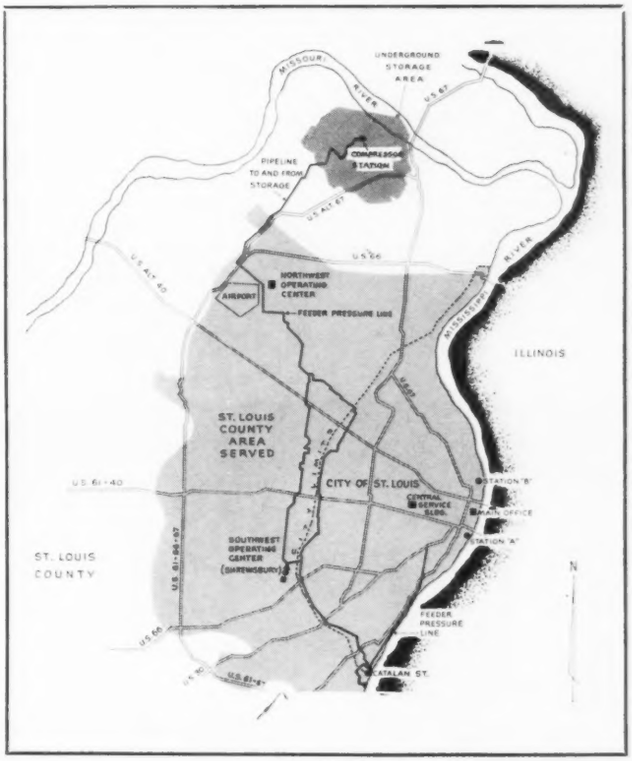
Northern Natural Gas Company engineers plan to develop the total deliverability from the Redfield aquifer to a peak-day maximum of 300,000,000 cu ft during the next five years as the company's markets develop.

Florissant. Development of a large shallow aquifer at the village of Florissant, only 16 miles from the center of greater St. Louis, has enabled Laclede Gas Company to remove 100,000 homes from its waiting list and add them to its regular house heating customer list.

One of the basic economic problems facing Laclede was that the usually mild climate of the St. Louis area created an extraordinary demand for gas that lasted for only three to four months during the year. Moreover, this short excess demand period would not justify the heavy cost required for additional transmission pipelines by its suppliers and/or tank or holder storage facilities that would assure an augmented winter supply of gas.

Laclede engineers found the solution of the problem in

Importance of Laclede Gas Company's Florissant Storage Field, north of St. Louis, to Laclede's distribution network in the St. Louis area is shown in the accompanying map.



natural underground reservoirs in the proximity of the greater St. Louis metropolitan market area.

With the technical assistance of the Missouri Geologist Survey, Laclede geologists commenced core drilling at Florissant during 1953. A suitable aquifer was found at a depth of only 1450-ft on the Florissant anticline.

Development took place during the ensuing two years and within a relatively short period of time, the Florissant aquifer was supplying more than one-fifth of Laclede's average deliveries of 480,000,000 cu ft per day.

Laclede's withdrawals of gas from this aquifer storage reservoir has already reached a record volume of 1,947,000,000 cu ft for the 1959-1960 heating season to March 2, 1960. This volume is certain to pass the 2-billion cu ft mark before the end of the current heating season.

The maximum peak-day withdrawal to date occurred on January 21, 1960, when 104,000,000 cu ft was withdrawn in a single day; this corresponds to 23.6 percent of the peak-load day sendout of 440,673,000 cu ft for the entire Laclede system for that date. This performance is made

possible by 16 injection and withdrawal wells. An additional 15 observation wells, situated principally on the periphery of the structure, correlate pressure variations with gas withdrawals.

Doe Run. Louisville Gas and Electric Company of Louisville, Kentucky, pioneered the aquifer method of underground natural-gas storage. Back in 1946, R. E. Stouder, a company geologist, conducted an experiment on the Doe Run, a water-filled anticline in Meade County, Kentucky.

The aquifer reservoir lies at an average depth of 650 ft in the "Corniferous" limestone, which is correlative with the Louisville limestone of Siluro-Devonian age.

Louisville Gas officials believe now that "we have explored the entire structure of some 2000 acres." The estimated ultimate capacity of the "working gas," or inventory gas, is 3.5-billion cu ft, and the cushion gas capacity is 1.5-billion cu ft.

Field development has now reached 65 facility wells drilled on an average spacing of 800 ft between wells. The maximum individual well potential ranges from 20,000,000 to 25,000,000 cu ft per well. The present maximum deliverability from the aquifer is 50,000,000 cu ft daily. Included in the development are three observation wells located around the periphery of the anticline to observe reservoir pressure behavior during pumping in or pumping-out operations.

Reservoir performance was relatively poor during the early development of the Doe Run aquifer, company officials state. With full development of the field, however, the pressure-volume relationship correlates much more closely with performance data from a nearby underground gas storage project developed in an abandoned gas field.

The Doe Run aquifer supplements two existing natural-gas storage projects developed by Louisville Gas engineers in old abandoned gas fields, i. e., the Magnolia and Muldraugh fields, both producing from the same "Corniferous" limestone formation.

Troy Grove. Northern Illinois Gas Company initiated its first storage aquifer project on a pilot basis at Troy Grove, Illinois, on July 23, 1958. It is anticipated that the project will be available for service during the 1960-1961 winter season with up to 100,000,000 cu ft available for withdrawal.

The Troy Grove aquifer site is situated between Mendota and LaSalle, Illinois, near the intersection of U. S. Highway routes No. 51 and 52. This anticlinal aquifer lies at an average depth of about 1400 ft and covers approximately 1500 acres.

In the $1,750,000 pilot-development expenditure, 8 deep wells were drilled for preliminary geological evaluation. One well was used for injection and the remainder for pressure observation during the course of the pilot gas-injection period.

Explorations at Troy Grove to date indicate the possibility of storing gas in three separate sandstones. Gas is being injected into the lowest section of the structure and at the beginning of 1960, amounted to about 5-billion cu ft. By the end of 1960, an anticipated 10 to 12-billion cu ft will have been injected into the various formations. Another large structure north of Troy Grove is being studied.

Importance of the underground storage reservoir to Northern Illinois can be seen in the fact that its peak day sendouts increased 835 percent in the 18 years prior to 1959, and were estimated to increase during the following 18 years by 335 percent.

Part 2 will appear next month.

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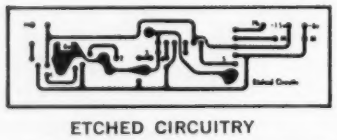
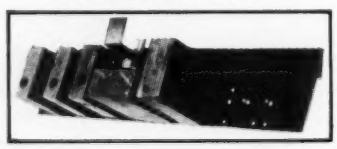


ETCHED CIRCUITRY



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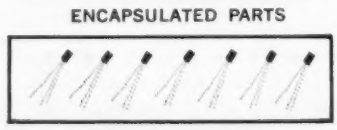

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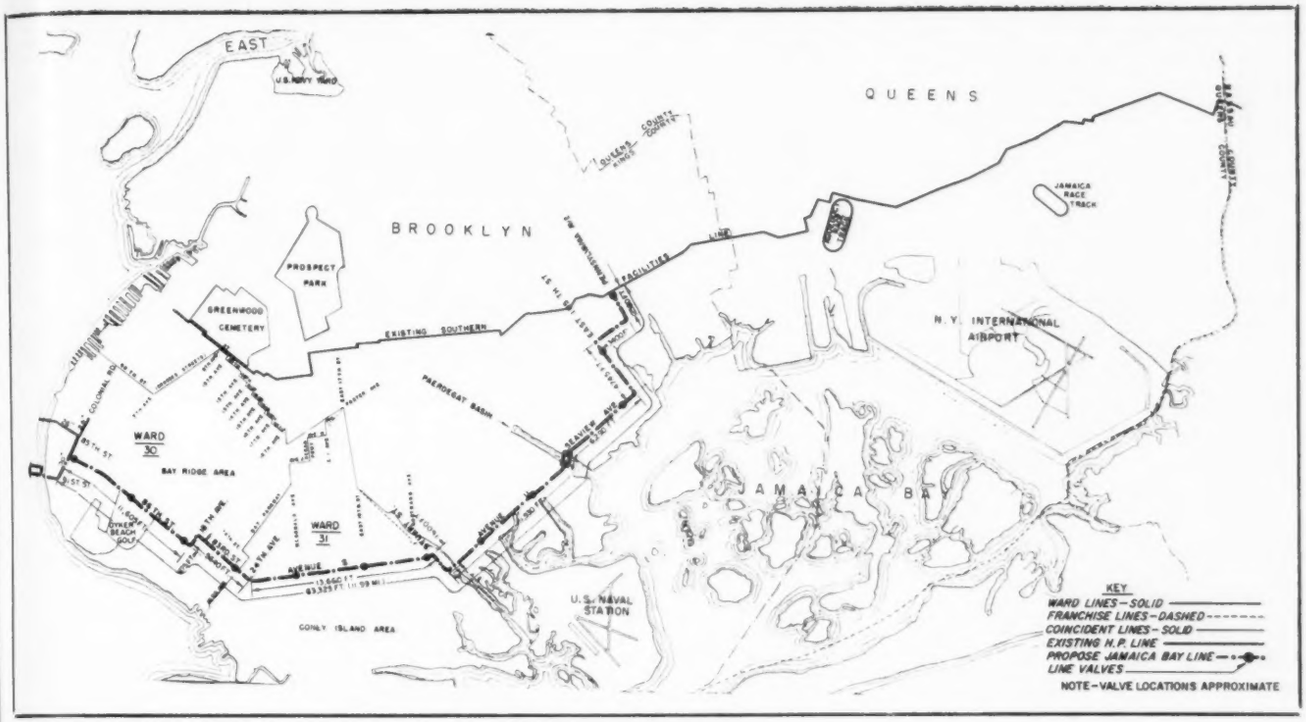


Route of the 11-mile, 30-in. high pressure main to be built in 1960 is shown on map.

Threading a 30-in. high pressure main through a complex underground network of pipes and ducts in a metropolitan area requires precise planning, patience, and piles of paperwork

Brooklyn Union's Jamaica Bay Line Construction To Climax Intricate Assignment in Planning

Robert J. Wheeler, *Senior Engineer*
Distribution Department, Brooklyn Union Gas Company, Brooklyn, New York

CONSTRUCTION will begin in April on a major portion of Brooklyn Union Gas Company's new Jamaica Bay line, culminating planning that began in earnest last summer. Some 7000 man-hours — devoted solely to drafting and field survey — were spent in developing plans on the portion of the line to be installed this year.

Basically, the Jamaica Bay line will be a 30-in., 350 psi main that will extend from an existing 30-in. spur at 86th Street and Colonial Road in Bayridge to the company's franchise boundary at the foot of Rockaway Boulevard in Queens. At that point Long Island Lighting Company will take over and extend the line into its territory. When finally completed, the Jamaica Bay line will be effective in providing for future growth for many years.

During 1960, Brooklyn Union will lay an 11-mile portion of the 30-in. line running through Brooklyn from 86th Street and Colonial Road to a point at Pennsylvania Avenue and Flatlands Avenue in East New York. In addition, a dual 1000-ft, 24-in. crossing at Paerdegat Basin will be made. A 2360-ft, 24-in. connection to BU's existing 26-in. New York Facilities line in Linden Boulevard will be installed at Pennsylvania Avenue.

In 1961, the line will be extended to the franchise boundary in Queens.

Planning the Line

A great deal is involved in planning the construction of such a line. First, it is necessary to pick what we believe to be the most economical route. Maps are checked and then a physical inspection is then made of the streets being considered. This inspection gives us information as to what is in, on, or over the route contemplated.

From the information on hand we pick a tentative route, trying to avoid busy shopping centers, heavily traveled streets, and areas where there are schools, churches, subways, and elevated structures for the obvious reason that these structures cannot be disturbed or their functioning impeded.

This is not always possible, however, for to go one long block out of our way would add roughly $70,000 to the cost of the installation. Therefore, the additional cost of going around a particular bad spot must be weighed against the added expense of going through or under the location in question.

Now and then we encounter a bottleneck; one such bottleneck is the reason we are going to install our line under Paerdegat Basin.

With the tentative route picked, we put our drafting section to work. Field survey parties are sent out to take grades and measurements of all structures in the streets. These included manholes, hydrants, poles, bus stop locations, driveways, curbs, and other fixed objects within the roadway or sidewalk areas.

Must Check All Utilities

While the survey parties are in the field, other draftsmen get information

from the records on where telephone, water, sewers, transit, fire, police, telegraph, Edison, and other utilities are located.

Our draftsman must check the proposed sanitary sewer maps, as well as the proposed drainage maps and also find out what additional water mains are being planned. This is necessary because city sewer lines and water mains have prior rights in city streets. It is necessary to find out where future mains will be installed to avoid having to move our line at a later date.

As the information flows in from field crews, preliminary drawings are started and once this information is plotted, we pick a lane for our 30-in. line and lay it out in plan and profile.

This is not as simple as it sounds.

At every intersecting street, we must cross all the underground utilities as well as our own existing gas lines. Electric ducts and telephone ducts are generally laid with 2 feet of cover, our own gas lines with 3 feet of cover, and water lines with 4 feet of cover; we must go under all of them.

If the route is near the shore line, as the major portion of this route is, the storm sewers will be high and we may have to go under them. If the storm sewers are large, they may force the line down still further, so that it has to be installed under the sanitary sewers, which are usually 8 to 10 feet deep.

One major item in the installation cost is excavation, so we try to keep the line as high as possible. The Public Service Commission calls for a minimum of 3 feet of cover and 1 ft clearance from all other structures. If we have less than 2 ft of cover, a steel shield must be installed over the pipe. If it is closer than 1 ft to another structure, a steel shield must be installed between it and the other structure.

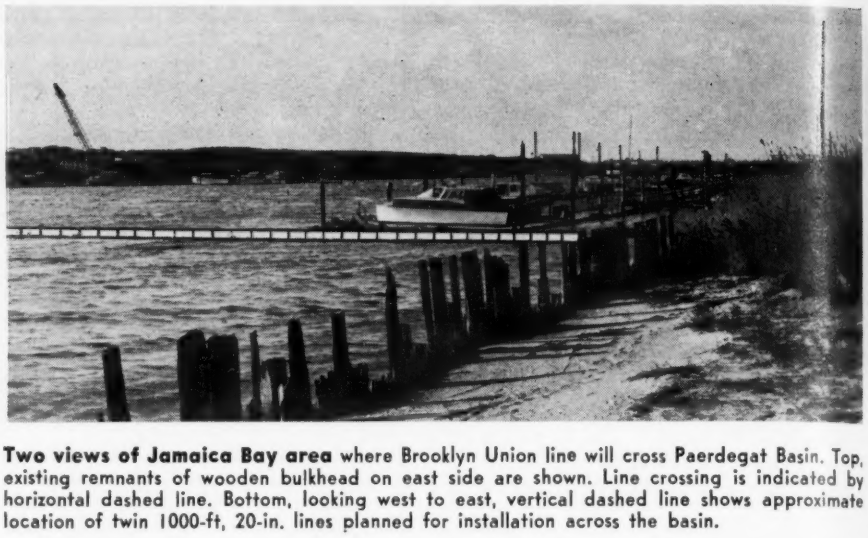
Bends Are Expensive

We are permitted to miter the ends of the pipe for a change in direction of not more than 4 degrees. Anything over that must be made with forged bends having 4-in. tangents on each end. As a result, we must use at least four forged bends at most of the intersections in order to go down and under other utilities.

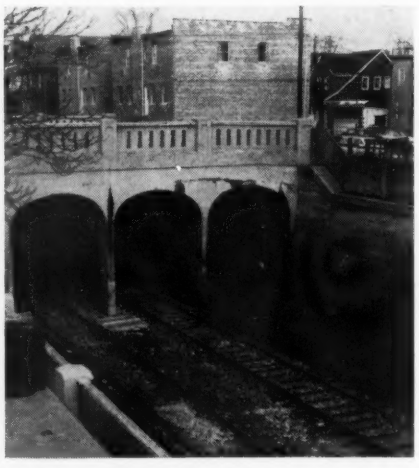
Staying high between intersections saves on the cost of excavation and backfill as well as sheathing.

The 30-in. diameter, odd-degree forged bends with 4-in. tangents must be forged long before construction begins. They are not stock items and they are expensive. It costs $415 each for bends of from 5 through 20 degrees and $536 each for those of from 25 through 40 degrees. As the degrees of bend increase, so does the price. Therefore, we try to keep within the 20 degree or the 40 degree range, whichever is more economical.

If we install a line over a subway, we must install a steel sleeve completely across the roof of the underground transit line, with a vent pole connected to the steel sleeve. If we install under railroad tracks, a steel sleeve is required with two vent poles, one venting from the top and one venting from the bottom of the sleeve.



Two views of Jamaica Bay area where Brooklyn Union line will cross Paerdegat Basin. Top, existing remnants of wooden bulkhead on east side are shown. Line crossing is indicated by horizontal dashed line. Bottom, looking west to east, vertical dashed line shows approximate location of twin 1000-ft, 20-in. lines planned for installation across the basin.



A 36-in. casing for the 30-in. line will push 130 ft under the Avenue S crossing of the Sea Beach Line at this point. The casing must extend 45 ft on each side beyond the near set of tracks to fulfill all requirements.

Our Jamaica Bay Line — the portion to be installed this year — involves a run of approximately 58,580 ft of 30-in. pipe, plus two 1000-ft 24-in. lines across Paerdegat Basin. There will also be a 24-in. spur of 2360 ft to connect the 30-in. at Pennsylvania and Flatlands Avenues with the 26-in. line at Linden Boulevard and Pennsylvania Avenue.

The Jamaica Bay Line is the longest installation of 30-in. pipe for which the distribution department has had to plan and prepare construction drawings in any one year.

When the job actually goes out for construction, a senior draftsman will be assigned to each contract to work with the engineer. This will be good experience for him, upon which he can draw in future construction planning in trying to avoid difficulties.

Many Approvals Needed

All of the proper agencies must approve our plans. A great many approvals and permits are needed.

If there is an underwater crossing, we must submit a satisfactory print to

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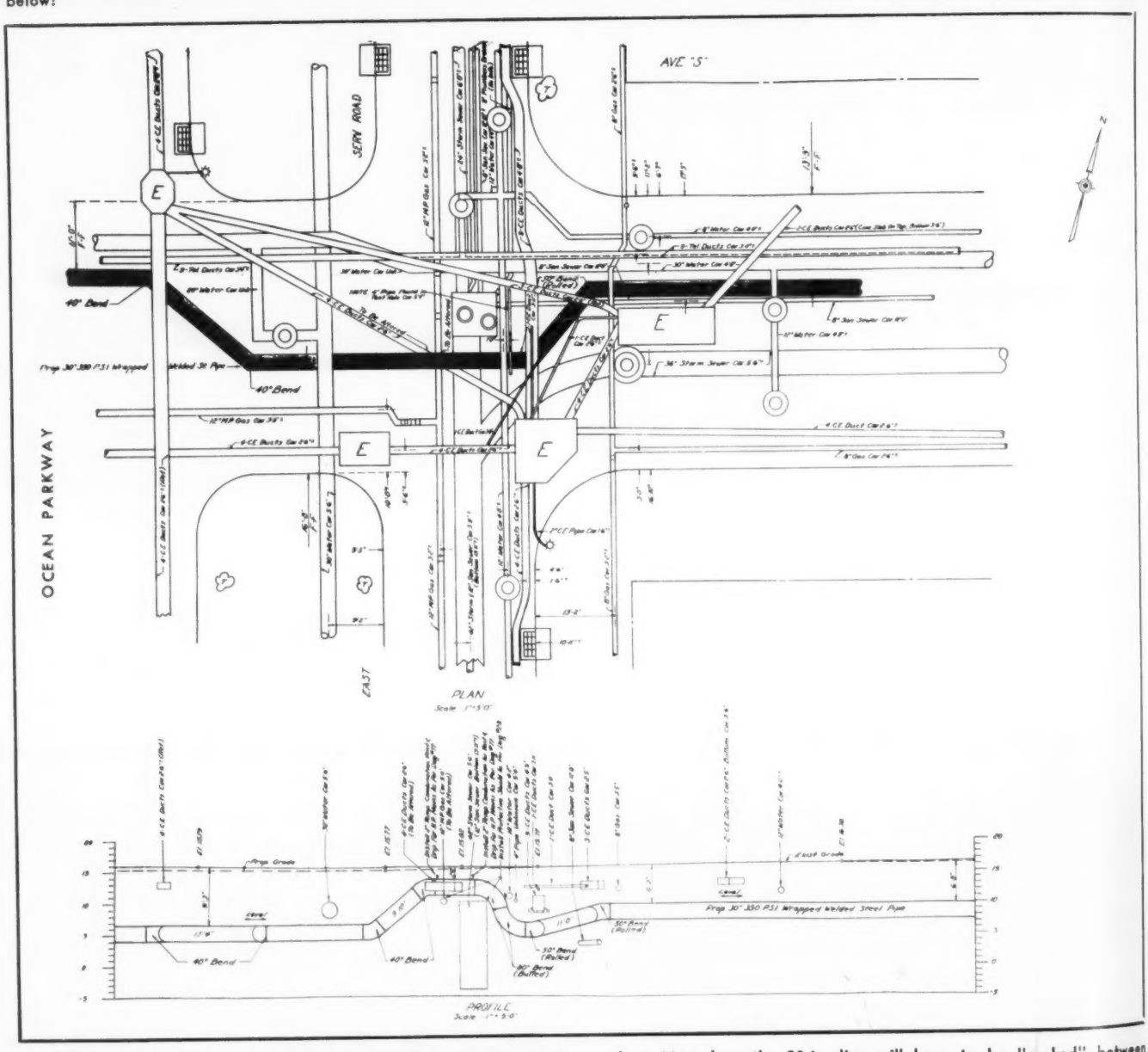
Intersection of Ocean Parkway and Avenue S appears to be a peaceful scene . . . but look below!

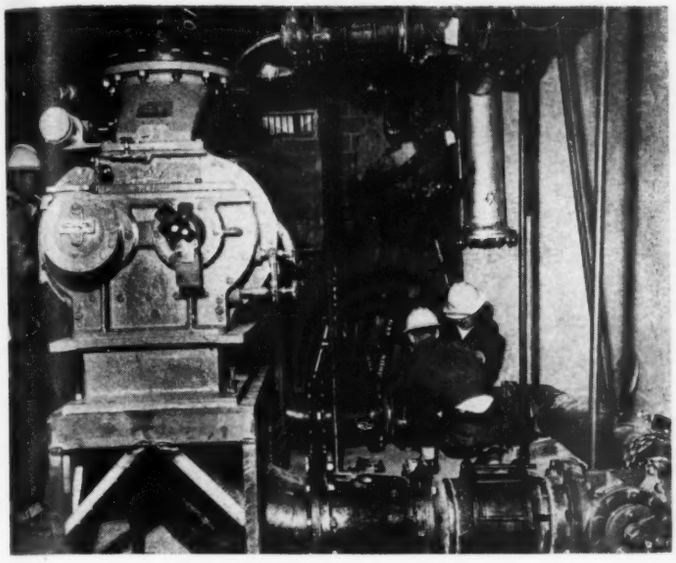
the United States Corps of Engineers to obtain a permit for the installation. The New York Department of Marine and Aviation is also involved in an underwater crossing and the print that we submit to that department must be much more detailed to obtain the permit.

In the case of the Jamaica Bay Line, we will be installing in the property owned by Marine and Aviation Department on each side of Paerdegat Basin. When we submit our plans for approval and request a permit, it will be necessary to make an agreement with their Property Management Division to pay for the use of their land on the basis of our standard tax rate.

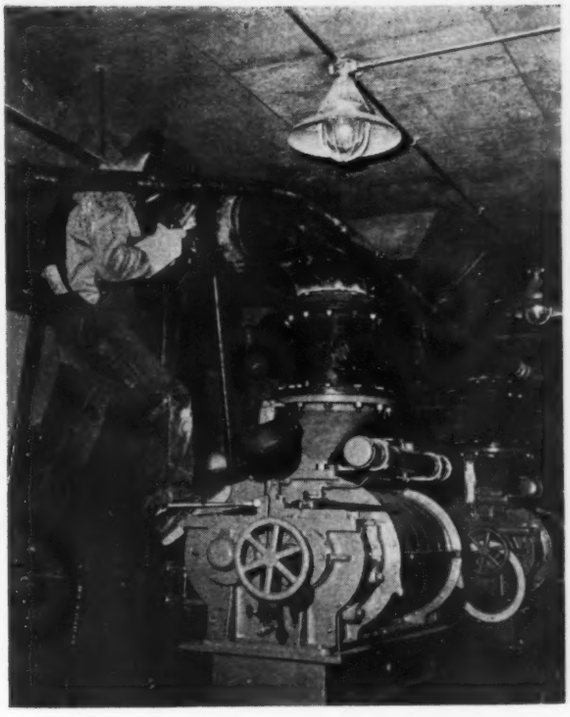
We must also obtain permits and approval from the city Water Department and from the Bureau of Highways and Sewers, as well as Public Service Commission approval. ★ ★ ★



Plan and profile view of east service road at Ocean Parkway and Avenue S belies the placidity of above photo and shows the complexity of subsurface structures. Many such intersections will be encountered during construction of Brooklyn Union's Jamaica Bay line. Note how the 30-in. line will have to be "snaked" between existing sewer and telephone lines and then "wound" back to the other side of the street.



PSCo gas shop workmen complete installation in the new Denver-Hilton Hotel of the two largest gas meters ever installed by the company. Each of the rotary-type meters is capable of handling 110,000 cu ft per hour.



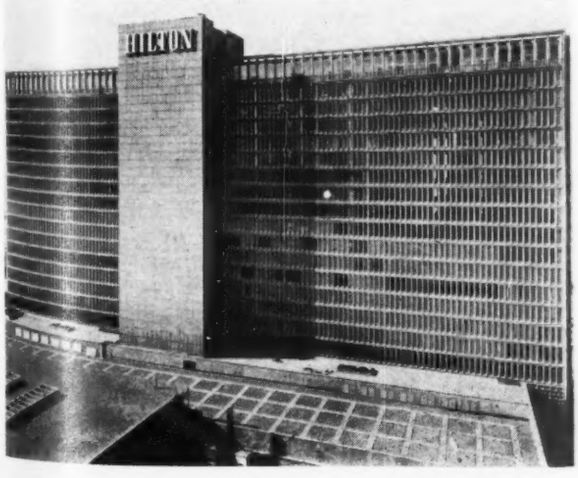
Ray Holloway, PSCo welder, makes final weld passes on 12-in. inlet fuel line into the new hotel. Line ties-in to a king-size, 3500-lb meter, first of its kind used by the gas utility.

Denver's Newest Hotel Has Denver's Biggest Gas Meters

Gene Telgmann, *Public Service Company of Colorado, Denver, Colorado*

A NEW CONCEPT IN GAS METERING was introduced in Denver recently by Public Service Company of Colorado with the installation in the new Denver-Hilton Hotel of two of the largest gas meters ever placed into service by the utility.

The two meters — each weighing 3500 lb — are rotary-type meters and comprise the largest meter installation in a hotel in the United States today. The two huge meters were required because of special conditions. The downtown Denver area is served with low pressure gas and use of orifice type meters wasn't possible.



Recently completed Denver-Hilton Hotel in the "mile high city" uses gas to fire four boilers to provide steam for heating, air conditioning, laundry, and other hotel services. Gas is also used in the hotel's restaurants.

Standard ironcase positive displacement meters of the 500-B type could not be used, either, as the amount of gas used by the hotel would have required 20 such meters, each weighing over 1000 lb, set side-by-side and tied together. This also would have necessitated building a separate large meter room and installing a complex tangle of piping.

To solve the space and piping problem, PSCo measurement engineers decided to install two 10 x 30 Roots Connersville rotary-type meters. The meters are capable of handling the hotel gas load in a small space and present a neat appearance, a prime requisite of company meter installation policy.

Each of the meters is capable of handling 110,000 cu ft of gas per hour and provides accurate measurement with as much as a 100 to 1 turndown, enough to take care of any expected load fluctuations. They will be used to measure gas supplied to four boilers in the new hotel's fourth basement. Domestic load, including gas supplied

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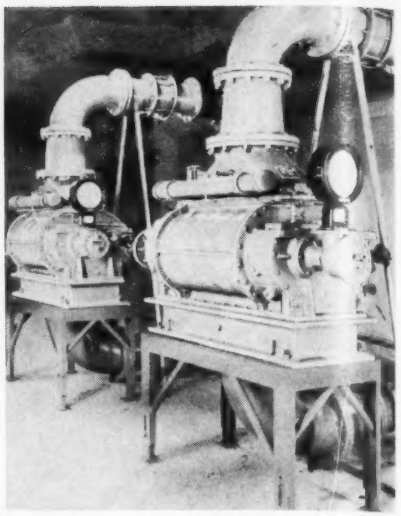


Completed meter installation of two 10 x 30 rotary positive gas meters presents neat appearance in hotel measurement room. Installation is largest in a U.S. hotel today.

to the Denver-Hilton's restaurants, will be measured separately. Total quantity of gas used by the hotel in one hour would supply all the gas needed by an average residence for an entire year.

The four gas-fired boilers provide some 140,000 lb per hour of 200 psig steam for space heating, turbine-driven centrifugal air conditioning, and other hotel services. Surplus steam in substantial quantities will be resold to nearby commercial buildings through PSCo's steam distribution system.

Installation of the meters was an accomplishment in itself, requiring close coordination between the gas shop and the installation crew.

Weight of the rotary meters presented something of a problem during installation. PSCo had no facilities for transporting them to the new hotel and hired an outside specialty transfer service to deliver them to the meter room.

Headers were prefabricated in the shop, with the pipe tying the two meters together having a 12-in. inlet and a 10-in. outlet. Shop facilities are not set up to handle such large welding jobs on a routine basis, but by using the best job knowledge and careful planning, the job was accomplished efficiently and rapidly.

All fittings on the hotel installation are welded fittings to assure maximum freedom from any possible leaks. A total of four days was required to complete the installation, not including shop fabrication time.

General contractor for the Denver-Hilton Hotel is Webb & Knapp Construction Corporation. Mechanical contractor was Kerby Saunders, Inc., under whose direction the gas-fired equipment and piping was installed. ★★

Can Compact Cars Cut Costs?

Columbia Gas System thinks so . . . and plans to add 800 small autos to its vehicle fleet; other gas distribution companies studying compact cars for economy, durability, adaptability

Welding inspector Claude W. Churchheus, Ohio Fuel Gas Company, uses mobile radio installed in a Ford Falcon to report progress on a distribution main construction job. Columbia Gas System (of which Ohio Fuel Gas is a part) will add 800 compact cars of the five U. S. makes to its fleets in the next four years.

Motor vehicle personnel at Columbia Gas System Service Corporation in Columbus check over newly delivered compact cars. Left to right are a Chevrolet Corvair, Ford Falcon, Chrysler Valiant, Rambler American, and Studebaker Lark.

COMPACT CARS are receiving considerable attention from the gas distribution industry and it seems apparent that the trend to the smaller, more economical vehicles will continue to grow.

Biggest news in the transportation activity of the industry came in mid-March with the announcement by Columbia Gas System of plans to acquire 800 U. S.-made compact cars during the next four years that will save CGS an estimated $340,000 in fleet acquisition and operating costs.

Columbia plans an immediate start on moving the domestic-built compact automobiles into the motor vehicle fleets of its various companies. CGS now has vehicle fleets totaling 3650 automobiles and trucks operating from three main headquarters — Pittsburgh, Pennsylvania; Columbus, Ohio; and Charleston, West Virginia.

It will take four years to integrate the 800 smaller cars into the CGS fleets. Columbia's vehicle replacement policy calls for replacement on the basis of 3 to 4 years service and 45,000 miles of use.

Combined savings in initial acquisition costs and gasoline consumption will approximate $340,000 during the four year period. After the fourth year, when the compact cars are fully integrated into the fleets, annual savings are estimated to be $125,000.

The U.S.-made smaller cars fit CGS's operating philosophy of always seeking cost-cutting procedures and devices, notes George S. Young, president of the extensive Columbia Gas System, pointing out that the firm has "a responsibility to the public to provide the best possible natural gas service at the least possible cost to consumers."

Choice Resulted From Study

Columbia Gas System Service Corporation, in cooperation with CGS's operating companies, studied the use of both American and European small cars at great length. It was finally determined that, in addition to acquisition and operating economies, the U.S.-made compact cars more completely satisfied operating requirements calling for:

1. Sufficient power for normal cruising speeds.
2. Automatic transmissions are available when required.
3. Adequate capacity for carrying essential tools and luggage.
4. Sufficient ground clearance to negotiate country roads.
5. Seating comfort.

Because of the diversified activities of the numerous subsidiary companies in the Columbia Gas System, vehicles are used in the performance of a wide variety of tasks. The smaller, U.S.-built autos will see service in practically every phase of natural gas operations — customer service, business promotion, underground storage, transmission, production, and land and leasing.

More Car (And Miles) Per Dollar

An average saving of $200 in purchase cost is estimated for each compact car acquired. Columbia estimates that $160,000 can be saved in the next four years, therefore, on the 800 autos it plans to buy. About 200 compact cars will be acquired each year through 1963.

Compact cars are also estimated to give about five extra driving miles per gallon of gasoline, and savings on gasoline consumption throughout the Columbia system are expected to be about $18,000 in 1960 and $72,000 annually by 1963. Total savings for the four years would approximate $180,000.

Evaluation of the U.S.-made compact cars by the Service Corporation indicated no definite preference for any of the five makes now available. As a result, CGS will not limit its acquisitions to any one particular make, but will probably integrate units of all five makes into its fleets. Chrysler's *Valiant*, American Motor's *Rambler*, Studebaker-Packard's *Lark*, the Ford *Falcon*, and General Motor's *Corvair* all proved of equal merit in meeting Columbia's operating needs.

Columbia's fleet automobile classification comprises four classes of automobiles appropriate for various uses. Class 1 vehicles, formerly the "low line" models of the "low-priced three," will all be U. S.-made compact cars when integration has been completed in 1963.

Other Utilities Investigating

A number of other gas distribution companies around the U.S. are studying the use of small cars as a means of holding down ever-increasing operating costs. Both European and American cars are being tested.

Boston Gas Company, early in 1958, purchased six English Ford *Anglias* and assigned the cars to several departments on an experimental basis, keeping records on performances and costs.

Public Service Electric and Gas Company of New Jersey, Newark, in 1958 also began testing the *Anglias*. *Six* of them were assigned to the commercial department for meter-reading work and 12 other units were assigned to the gas operating department and the electric operating department.

Washington Gas Light Company has been testing a two-door *Volkswagen* on numerous assignments.

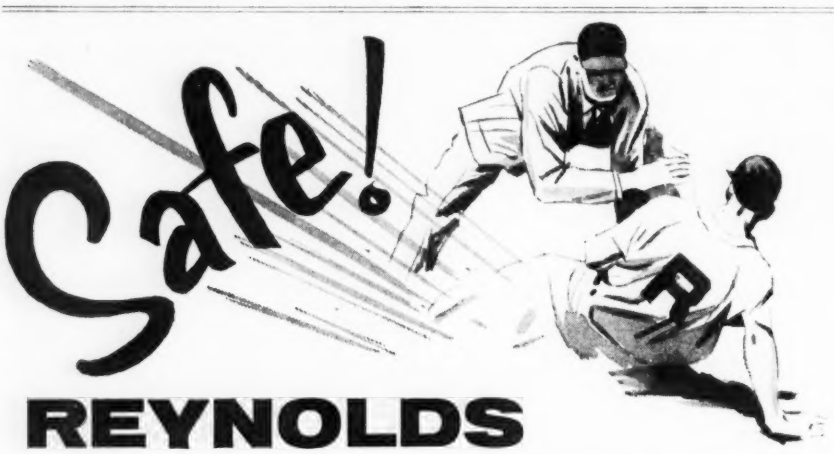
Volkswagen panel trucks have also made their way into the fleet of Long Island Lighting Company, being used by the gas customer service department. Fitted with bins, cabinets, and meter racks, the vehicles have "proved to be the most practical all-purpose truck for that department."

Long Island Lighting is also testing U.S.-made compact cars — a Studebaker-Packard *Lark* and an American Motors' *Rambler* — and keeping records for evaluation as to economy and durability.

Brooklyn Union Gas Company is using two small-sized panel trucks manufactured by Ford Motor Company, Ltd., of England. The ¼-ton trucks, called "vans" in England, have been fitted with windows in the rear panels and straps to hold meters in place. They are being tested for serviceability in meter replacement work.

Arizona Public Service Company in December 1959 began testing of several American-made compact cars in their motor pool for statewide company driving. Under test are a Ford *Falcon*, Studebaker *Lark*, and a Rambler *American*. The company plans to add a Chrysler *Valiant* and a Chevrolet *Corvair* for testing.

Southern California Gas Company in Los Angeles purchased a Chevrolet *Corvair* in October 1959 and recently placed orders for a Ford *Falcon* and a Chrysler *Valiant*. SoCal plans to test performance of the compact cars with presently employed autos to determine the feasibility of using the smaller cars for general company use. * * *



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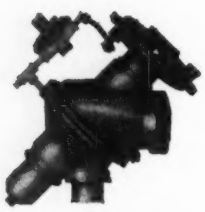

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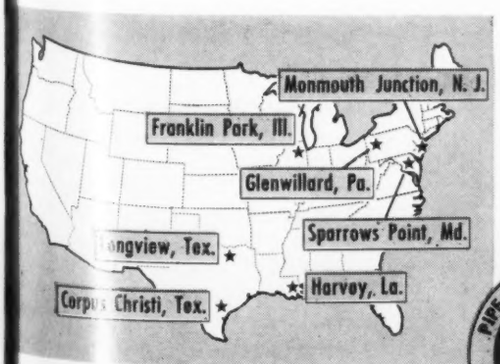

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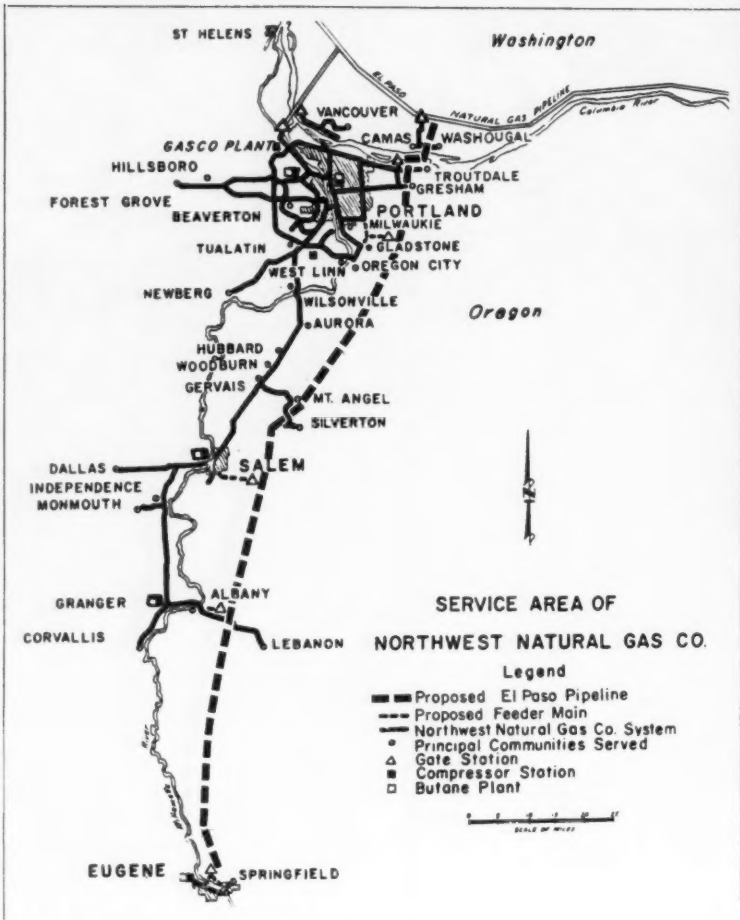


Construction is underway on a $10,500,000 lateral gas pipeline that will extend for nearly the length of the Willamette Valley in western Oregon.

El Paso Natural Gas Company is building the 125-mile line as an addition to the system it acquired with merger of Pacific Northwest Pipeline Corp. FPC granted a temporary certificate February 11. Target date for completion is July 31.

The new line will open one entirely new market for natural gas — the Eugene-Springfield area with about 105,000 people and steadily growing industry.

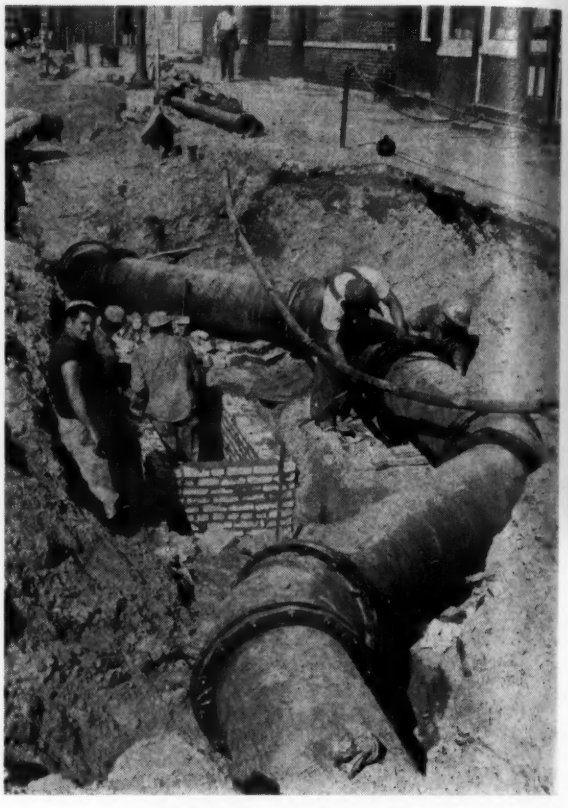
Northwest Natural Gas Company, only gas distribution utility on the route of the El Paso lateral, has added $3,200,000 to its regular $5,000,000 new construction budget for facilities to handle the new gas supply.

N.N.G. will take the gas at five new gate stations, including two close to the east side of Portland and one each near Salem, Albany, and Eugene. It plans to invest more than $1,000,000 in its Eugene grid system as it converts that area from propane-air gas to natural gas.

The new supply will free N.N.G. for further rapid firm load growth south of Portland, and make possible serving valley industries estimated at half the potential of the utility's present industrial load in the Portland area.

The new line starts with 18 miles of 20-in. pipe, which extends through the metropolitan area, and tapers to 10¾-in. pipe at the Eugene terminus.

Work began first on the 3000-ft crossing of the Columbia River, and this is being rushed to beat the spring runoff. Hood Construction Company, of Whittier, California and Boise, Idaho has the contract for the line from Camas to Salem.



Relocation of gas mains and installation of new lines along the new Third Street in Cincinnati at a cost of approximately $130,000 has been completed by Cincinnati Gas and Electric Company. Project involved clamping of 232 cast iron bell and spigot joints, including 201 21-in. joints. Company crews cooperated closely with sewer line contractor so gas line progress could proceed as soon as section of sewer line had been completed. Bypassing of catchbasins (as shown above), addition of lines on streets running north and south for future use, and installation of new lines were only a part of many jobs involved.

Inland Natural Gas Company, Ltd. Vancouver, British Columbia, plans to spend approximately $750,000 on new service connections during 1960. The company is negotiating to supply gas to the new $50,000,000 Canadian Chemical & Cellulose Ltd. pulp mill now under construction at Castlegar.

Illinois Power Company, Decatur, Illinois, plans to spend approximately $11,700,000 on additional natural gas facilities during 1960, according to Allen Van Wyck, utility president. This figure might be increased by as much as $6,000,000 for additional gas facilities if enough natural gas becomes available during the year, it has been announced.

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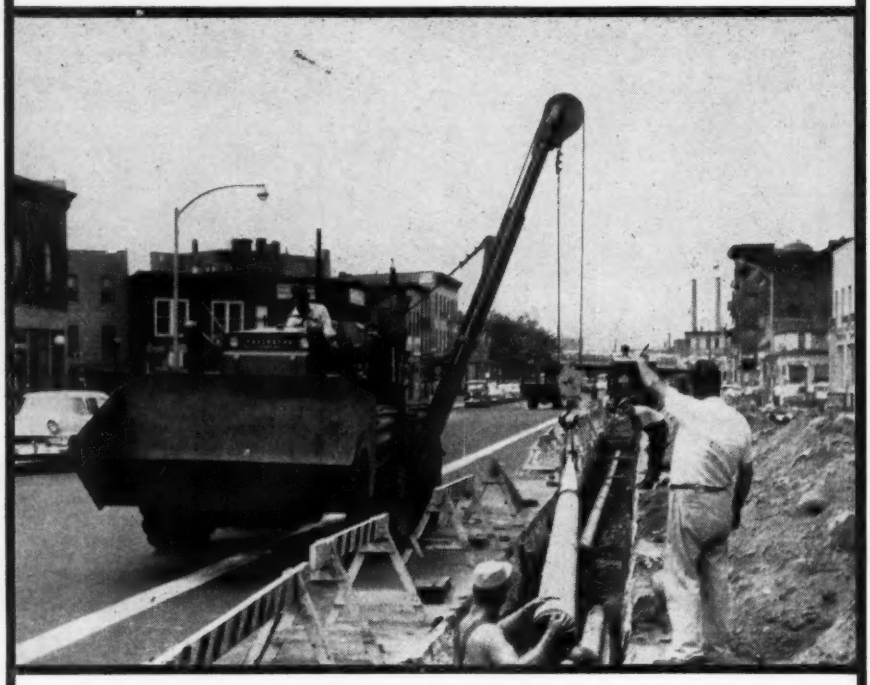

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Northern Indiana Public Service Company, Hammond, Indiana, has been granted franchises to serve natural gas to four additional communities. Reynolds, Wakarusa, Milford, and Syracuse, all in Indiana, have joined a growing list of 23 northern Indiana communities who will be added onto NIPSCO's natural gas distribution system within the next two years. Petitions have been presented to Bristol and Ligonier, and are pending approval before public hearings. Construction of a 6-in. gas line connecting North Judson with NIPSCO's gas system was completed in December and construction of a distribution system in the town is nearing completion. A 4-in. distribution main is being laid along Talmer Street in the southwest section of the city with 2-in. laterals extending from the 4-in. main to other streets, depending on the requirements of residents for gas service.

Peoples Natural Gas Division of Northern Natural Gas Company, Omaha, Nebraska, added 4393 new customers during 1960 bringing its total to 93,237. Peoples now provides retail natural gas service in 119 communities in Iowa, Minnesota, Nebraska, and Kansas, having constructed distribution systems and initiated service in eight communities in Minnesota and one in Nebraska. Among the eight Minnesota communities were: Sturgeon Lake, Sandstone, Hinckley, Mora, Braham, Rush City, Harris, and North Branch, all located on the 116-mile transmission line from Farmington to Duluth recently completed by parent company Northern Natural.

New Jersey Natural Gas Company, Asbury Park, New Jersey, spent approximately $3,713,620 for new construction in 1959, a record high. As a result of this construction and an aggressive sales campaign, 6334 customers were added last year, a gain of 5.15 percent, bringing the total number of customers in all classifications to 129,228. Gas heat continued to gain in popularity during 1959, and the number of heating customers at year's end was 43,675, a gain of 17 percent over the previous year. As the result of a vigorous sales program, New Jersey Natural has experienced the resurgence of gas as the prime fuel for cooking. Of all the custom-built homes constructed in their service area last year, 88 percent installed gas ranges. In direct merchandising, company sold 771 gas ranges, 63 percent more than in 1958. Overall, the sales program resulted in the company selling 2530 appliances last year, an increase of 59 percent over 1958.

New Bedford Gas and Edison Light Company, New Bedford, Massachusetts, (subsidiary of the New England Gas and Electric Association) recently installed a new blower for gas making that is designed to deliver 40,000 cu ft of air per minute at a discharge pressure of 75 in. Unit is driven by a 600 hp 3560 rpm induction motor. A new compressor has been installed in the gas works engine room and is designed to deliver 150,000 cu ft of gas per hour at a discharge pressure of 50 psi. It is driven by a 350 hp, 277 rpm synchronous motor. A new aftercooler, designed to cool 400,000 cu ft of gas per hour, also has been installed.

Long Island Lighting Company, Mineola, Long Island, New York, plans to spend approximately $11,000,000 in 1960 for construction of new gas facilities, mains and services; and approximately $5,000,000 for erection of gas and electric operations centers. During 1959, the company spent $9,745,000 on gas mains, plants and equipment, and $3,714,000 on other buildings and facilities.

Approximately 160 miles of main were installed last year, of which 132 miles, as well as another 151 miles of service pipe, were required to handle the requirements of new customers. The remaining 28 miles of main were installed for operational improvement. More than 13,000 new gas customers were added to LILCO's system last year to bring the total average number of customers to 320,802.

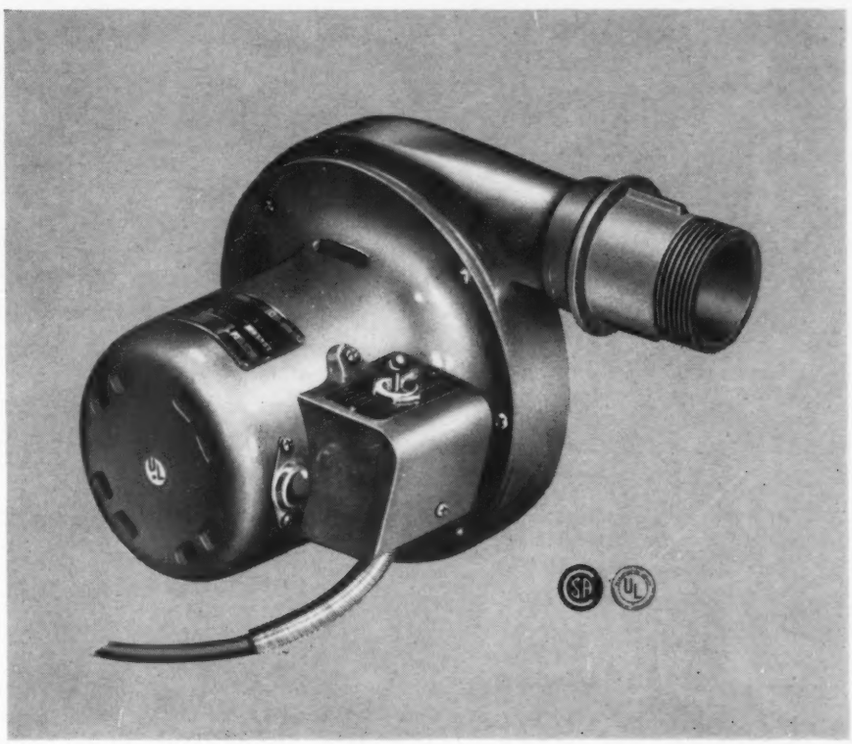
During 1959, company installed a supercharged 1500-hp gas engine booster at its Glenwood Gas Plant that will be used to raise the pressure of incoming natural gas to permit its transportation through new trunk mains presently extending easterly as far as Commack.

A new $3,000,000 operations center at Brentwood, serving western Suffolk County, was completed in 1959. A fourth major operations center, similar to those at Hicksville, Brentwood, and Hewlett, is planned for Riverhead and will serve eastern Suffolk. Modernization of the Roslyn sub-operations center, which serves the northerly section of Nassau County, was started during 1959. A series of sub-operations centers, similar to Greenlawn and Roslyn, are planned for Bellmore, to serve southeastern Nassau, another at Setauket to take care of north central Suffolk area, a third at Bridgehampton to serve the southeast fork of Long Island and a fourth at West Babylon to meet needs of southwestern Suffolk.

LILCO also plans to construct approximately 15 miles of gas trunk main extensions from Commack to Smithtown to Holtsville in 1960.

San Diego Gas & Electric Company, San Diego, California, added 19,617 new gas customers during 1959 to bring the total number of gas customers at the year's end to 254,740. Company plans to continue its operational program of decentralization in 1960 with the construction of three more district operating headquarters buildings to be known as the Dells (largest), Rose Canyon, and Southern, at an estimated cost of $1,500,000. They are scheduled to be completed in August. A fourth operating headquarters will be built at a site and a date as yet undetermined. The Dells will be located between Market and "F" Streets, east of 33rd Street in San Diego, the Southern operating headquarters will be located in the city of Chula Vista. The three existing district operating headquarters are now located in El Cajon, Oceanside, and Escondido.

New England Gas and Electric Association, Cambridge, Massachusetts, plans to start construction this spring on a new $1,000,000 five-story office building in Cambridge. The new building, which will have 45,000 sq ft of office space, will serve as company headquarters replacing the present Cambridge headquarters building.



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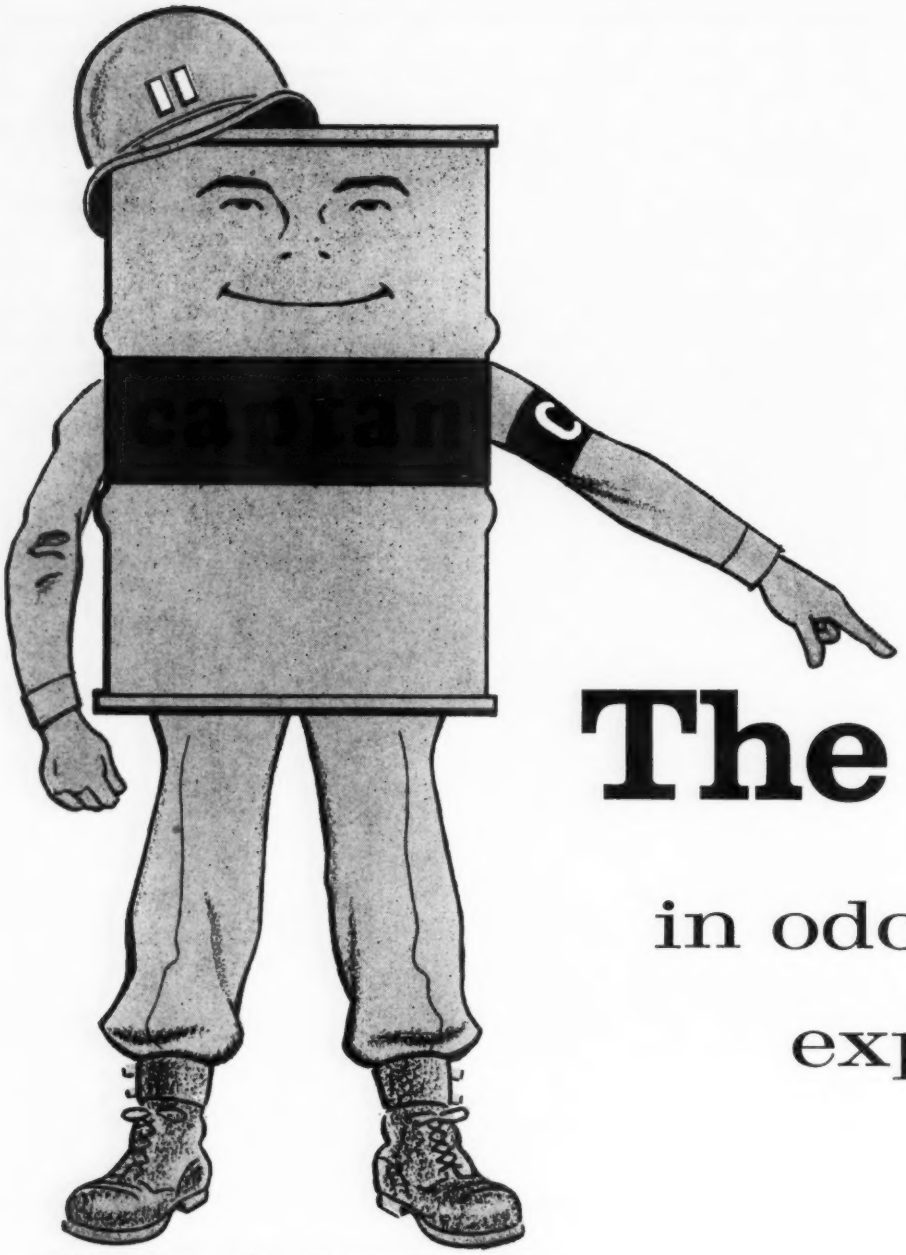

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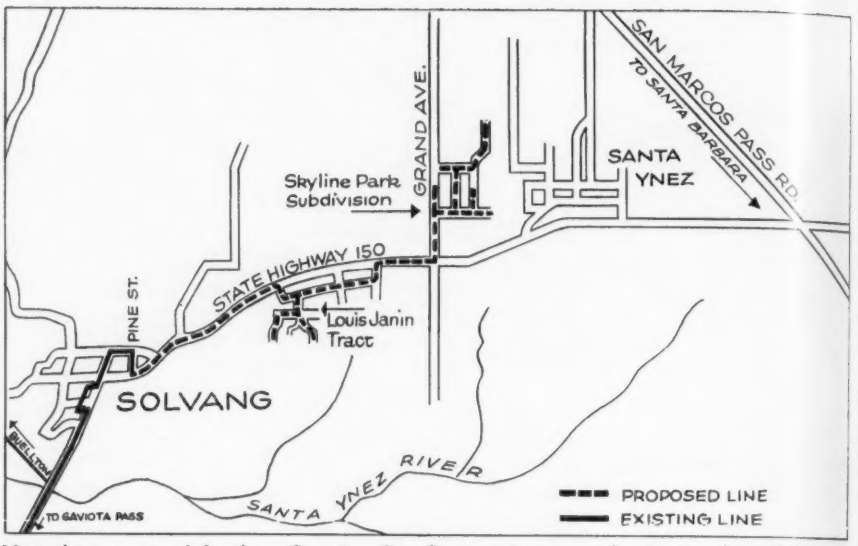
Southern Counties Gas Company, Los Angeles, California, has asked for PUC permission to extend its supply line from the community of Solvang easterly along State Highway 150 to Santa Ynez. The line, which will allow the company to add nearly 70 new customers in the new housing developments in Louis Janin tract and Skyline Park subdivision, will cost approximately $50,000 and involves installation of 12,690 ft of 3-in. and 11,350 ft of 2-in. The line will be connected to the 4-in. Solvang-Buellton extension, which ties into the Santa Maria-Goleta 8⅝-in. line just north of Gaviota Pass.

Construction is underway on a $200,000 extension project in the Northern division to bring natural gas to more than 300 new customers in the seaside community of Baywood Park in San Luis Obispo county. Project involves more than 80,000 ft of main; approximately 14,000 ft of 4-in. line has been completed tying Baywood Park into the San Luis Obispo-Morrow Bay supply line.

Industrial growth in the recently formed City of Industry necessitated installation of 6600 ft of 16 and 12-in. line, including a 20-ft deep channel crossing of Puente Creek, to serve the Bassett-La Puente distribution area. Route of the new 16-in. line, installed along Don Julian Road, was from the intersection of 9th Avenue east to 6th Avenue. The 12-in. line follows 6th Avenue north from Don Julian to Valley Boulevard.



Map shows route of Southern Counties Gas Company's proposed extension from Solvang to to Santa Ynez.

Southern Counties reports a 6.8 percent increase (45,883) in new customers in 1959. This is the largest meter growth since 1956, when 47,643 meters were added, and brings the total number of independent active meters for Southern Counties to 716,475. Orange County exceeded all company divisions in total number of meters added —some 18,829 for an 11 percent gain over 1958. Eastern division with 6510 new meters and a 5.4 percent yearly gain, was next. Both Santa Barbara and Ventura County divisions showed gains of over 8 percent. Northern division where 4318 meters were added last year showed the largest percentage growth — 15 percent.

Midwestern announces four design changes in LITTLE BOOMER PIPELAYER

1. NO LOAD-LINE CREEPAGE— new anti-reverse design of winch gears eliminates creepage . . . assures positive control.

2. AUTOMATIC BOOM TRAVEL STOP — built-in switch bypasses hydraulic fluid when boom reaches upper limit . . . prevents bending boom over tractor.

3. STREAMLINED MAIN FRAME — redesigned main frame is stronger, more compact . . . tailored to fit each individual tractor.

4. NEW COUNTERWEIGHT CASTINGS — counterweights are more effectively positioned for better balancing . . . more lifting power. Available from 1000# through 2400#.

Midwestern's Little Boomer also features the exclusive double-drum winch arrangement which places both winches side-by-side and in full view of the operator at all times. The Little Boomer is available for crawler and wheel tractors built by CATERPILLAR, J. I. CASE, JOHN DEERE, FORD MOTOR CO., INTERNATIONAL HARVESTER and OLIVER CORPORATION. Midwestern's angle back fill blades and hydraulic tail-end winches are available as attachments for the above tractors.

LITTLE BOOMER OFFERS MANY ADVANTAGES TO PIPELINE CONTRACTORS — UTILITY COMPANIES

• Low Initial Cost • Low Operating Cost • Low Maintenance Cost • Simple, 2-Lever Control • Safety-Absolute Control of Load at all times

MIDWESTERN MANUFACTURING COMPANY
P. O. Box 1886 Cable Code Address "MIDPIPE"
Tulsa, Oklahoma, U. S. A.

*Your **FISHER/MAN** says: Have your cake and eat it too!*

THE IDEAL REGULATOR FOR OVER-RIDE OR MONITOR SERVICE

Big flow capacity with very low pressure drop

the FISHER 298T-3057

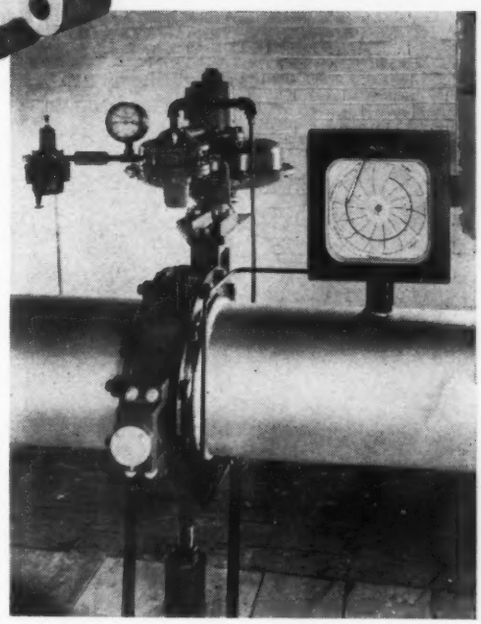
ultra-sensitive regulator

- Low initial cost
- High capacity with low pressure drop
- Sensitive regulation
- Reduced maintenance
- Ideal for accurate metering
- Wide rangeability
- Highly stable—non-pulsating
- Widely used as over-ride or monitor type regulator, or as a district regulator

The excellent throttling characteristics of the butterfly valve, in combination with the ultra-sensitive Type 298T topwork, make this unit ideally suited to installations requiring high flows, and where only a very low pressure drop can be permitted.

The combination of the 298T and the 3057 maintains constant downstream pressures within very narrow limits, and is particularly well suited as a monitoring or over-ride regulator. In cases where space is at a premium, the 298T-3057 can frequently help solve the problem because it takes up only a few inches of line space.

Type 298T topwork is available in two sizes: Size 50 with maximum control pressure of 65 psi, and Size 60 with maximum control pressure of 35 psi.



12" 298T-3057 installation in New England reduces 8" to 40" WC to 7" WC outlet pressure. Capacity range is 20,000 to 80,000. Previously two 20" regulators were required. The Fisher 298T pilot operated actuator used in combination with a Fisher-Continental Butterfly Valve therefore represented substantial savings in initial and installation costs.

For further information and specifications write for Bulletin No. P-84.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

FISHER GOVERNOR COMPANY

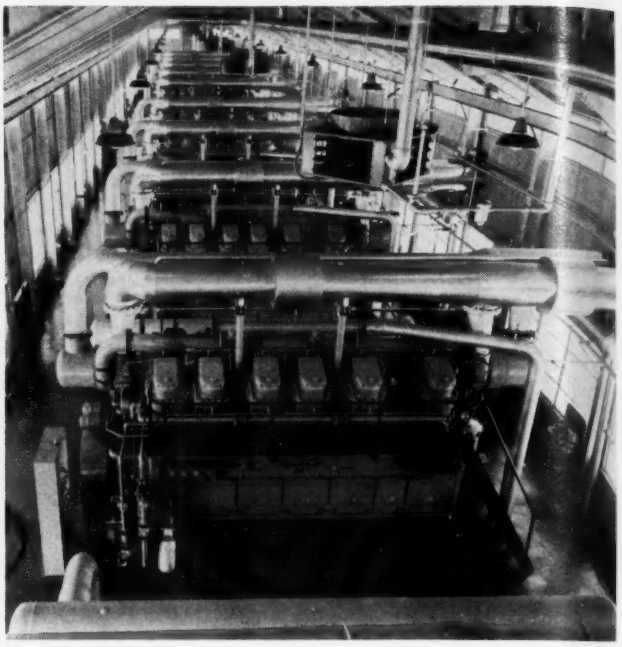
Marshalltown, Iowa / Woodstock, Ontario / Rochester, England

BUTTERFLY VALVE DIVISION: CONTINENTAL EQUIP. CO., CORAOPOLIS, PA.

FISHER® Controls

SINCE 1880

Fur hats are fashionable at Six Lakes, Michigan, where "winter" means "cold." That's the experience of Harry Gabel, general manager of Michigan Consolidated Gas Company's underground natural gas storage plant at Six Lakes. In background are some of the new facilities installed at cost of $4,800,000 that doubled the size of the plant's installed horsepower.



Inside the new compressor plant at Six Lakes are ten 2000-hp engine-compressor units. They'll help provide Michigan Consolidated with more than 1-billion cu ft of gas from underground storage on peak days. With the additional 20,000-hp shown above, Six Lakes now has total of 40,000-hp — biggest underground storage compressor plant in the world.

World's Biggest Underground Storage Compressor Plant Totals 40,000-HP

Michigan Consolidated Gas Company's Six Lakes storage facility doubled in compressor capacity with addition of ten 2000-hp units at cost of $4,800,000

ADDITION OF 20,000-HP to the Six Lakes Station of Michigan Consolidated Gas Company has doubled the compression facilities at the underground storage site and makes the station the most powerful underground gas storage compressor plant in the world with a total of 40,000-hp. That's 25 percent more than the next largest storage installation.

Investment in the Six Lakes facility now is nearly $20,000,000. The site is located some 50 miles northeast of Grand Rapids.

New facilities at Six Lakes, installed at a cost of $4,800,000 include ten 2000-hp engine-compressors, each weighing 78 tons and mounted on a 235-ton concrete foundation, plus a block-long galvanized steel building. Gas conditioning facilities added include four new oil bath scrubbers, four after-coolers, and a fourth dehydration unit.

The after-coolers are used to cool the gas from 260 F to 100 F after compression.

The dehydration units each contain 47 tons of activated bauxite, used to absorb water vapor picked up by the gas while it is in storage. The units are 60 ft long, 8 ft in diameter, and weigh 110 tons.

The Six Lakes storage field was once Michigan's largest producing gas field. As it neared depletion in 1953, Michigan Consolidated acquired storage rights covering more than 23,000 acres. The hard but porous sandstone, in which gas was originally discovered and is now stored, lies approximately 1300 ft below the surface. The sandstone is capped by shale, which prevents gas escaping from the field.

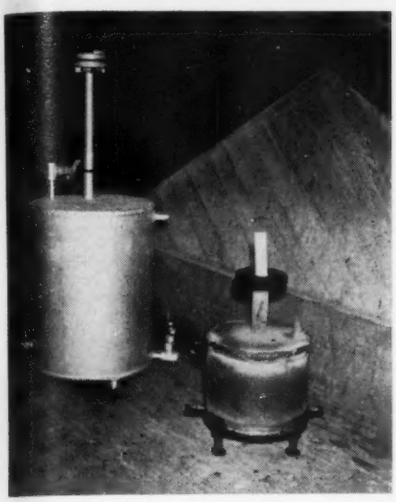
The underground storage field has a storage capacity of 53 billion cu ft of gas, with an additional 14-billion cu ft used as cushion gas. Gas for storage in the field is transported during the summer from the Willow Run measurement station, where Michigan Consolidated receives gas from American Louisiana Pipe Line Company. During the winter heating season, the same lines are used to take gas from Six Lakes back to the company's service areas — principally the Detroit metropolitan area.

Addition of the 20,000-hp in compression facilities was needed to maintain gas pressures in the lines carrying the gas back to the company's distribution areas. In the early winter, when gas pressure in the field is at its highest, minimum compression is required to move the gas to market. As gas is withdrawn, however, field pressure drops and more compression is required to move the gas. The new installation will allow maximum utilization during the late winter when some of the coldest weather occurs, demand is high, and field pressure is nearing its lowest point.

Six Lakes station moves gas in and out of the storage field through 50 miles of lines that feed the 171 wells used for gas injection and withdrawal. The wells are spaced at 40-acre intervals throughout the field. ★ ★ ★

PRODUCT PARADE

MATERIALS – EQUIPMENT – SERVICES



SMALL TOWN ODORIZER of the compact by-pass type manufactured by Southern Manufacturing Engineers, Inc. is suitable for direct or remote installation. Features movable float that insures direct contact of gas with odorant level. Liquid level of odorant can be measured by using electromagnet level senser without taking odorizer out of service. Chart book furnished with each odorizer provides space for actual and correct odorant usage. Odorizers can be custom built to suit any installation in sizes 1 to 10; 10 to 25, or 25 to 50 mmcf.

CIRCLE (1) ON THE REPLY CARD

METER READING CASE—The Wright Line, Inc. of Worcester, Massachusetts, manufacturers of data processing accessory equipment, now has available a meter reading case that will be useful for any utility company using punched cards for billing customers. Case holds 300 or more cards arranged in the order the utility employee follows in the reading of meters. Meter reader can write the meter figures on the card with a special sensing pencil, then insert the card at the bottom of the case.

CIRCLE (2) ON THE REPLY CARD

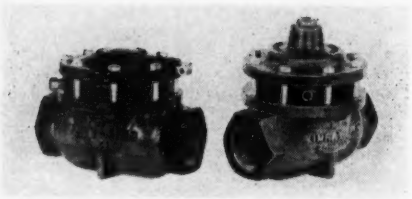
INTERNATIONAL SUPERIOR SBI-92 SIDEBOOM and 92 AF blade backfiller, a favorite rig of distribution contractors and gas utilities, is the subject of a 4-page folder recently issued by International Harvester Co. Unit is capable of lifting pipe loads up to 18,000 lb at 4-ft overhand, is a low-maintenance package that can be easily transported from one job site to another. Ample track with perfect balance of the tractor unit gives extraordinary lift, excellent flotation.

CIRCLE (3) ON THE REPLY CARD

NEW CADILLAC FLOW PROVER BLOWER for proving displacement gas meters at location or in the meter shop is described briefly in 2-color specification sheet just released from Clements Mfg. Company. Unit is equipped with powerful 2-speed 115 v ac-dc motor that provides 196 cu ft of air per minute at high speed, 150 cu ft of air per minute at low speed. Blower comes ready to connect to 2-in. pipe; motor has 20 ft of reinforced, rubber covered, Underwriters' Laboratories and Canadian Standards Approved 3-wire cable with plug. Is easily portable — weighs only 15 lb — and comes complete, ready for attachment to the test rig.

CIRCLE (4) ON THE REPLY CARD

NEW Lancaster VALVE COVER
eliminates practically all troubles from normal sticking and lifting valves . . .
* Gum-resistant dog specially compounded of friction-free inert carbon-graphite
* Large-Profile Seat offers greater contact area
New, Improved Lancaster Carrier Wire Assembly
keeps pans moving in straight line . . .
Side carrier bracket height adjustment assures most accurate positioning . . . oval slots in new center bracket allow straight through diaphragm travel. Center bracket available separately adapts to any carrier wire. Porous bronze graphite bearings throughout.
"a meter is only as accurate as its parts"
Lancaster METER PARTS CO.
Manufacturers of Quality Parts for Gas Meters
POST OFFICE BOX 278 LANCASTER, OHIO



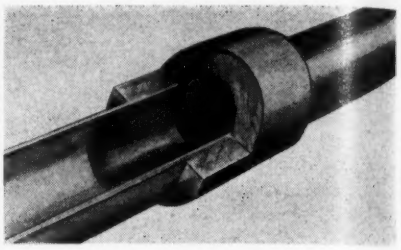
KIMRAY, INC., has added a "5 to 1" series motor valves to their line of gas equipment and controls. The new "5:1" series have reduced inner valves, with the area 30 percent of full line size which allows the series to be used on oil and gas separators and liquid meters where a 30 psi maximum pilot supply is available to actuate valves operating at pressures up to 125 psi.

CIRCLE (5) ON THE REPLY CARD

INDUSTRIAL CONTROLS CATALOG lists a comprehensive line of General Controls products. Information from several other catalogs has been combined to present a comprehensive line of products including automatic temperature, pressure, level and flow controls, as well as counters, switches, and automation controls. Also illustrated and described are industrial actuators, combustion instrument controls, controller indicators and pressure indicators. A section on the "Hydramotors" electro-hydraulic actuators having many patterns, designs, and valve body materials is also included. The Hammel-Dahl Division and Foster Engineering Division lines are also shown.

CIRCLE (6) ON THE REPLY CARD

NEW TYPE OF PIPE COUPLING, called *Thermocoupling,* is being introduced by Continental Industries, Inc. of Tulsa, Oklahoma. Thermocoupling is a



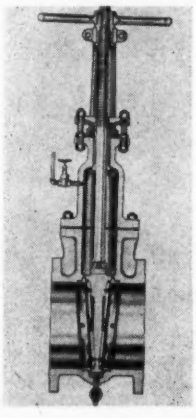
thermite weld connection which is completed in a matter of minutes on ¾ to 1½-in. pipe. No external source of power is required. Thermocoupling is a fusion weld which is permanent and cannot be loosened by vibration. The coupling becomes an integral part of the pipe by fusing to it; requires no bolting, threading, or cutting.

CIRCLE (7) ON THE REPLY CARD

ORIGINALLY DESIGNED for the U. S. Army Corps of Engineers, the Barber-Greene Model 750 ditcher has been released for purchase by civilian users. Unit is a high-speed, heavy-duty, pneumatic tired vertical boom machine that can dig up to 2 ft wide and 6 ft deep. It has been tested and operated at temperature ranges from 125 deg above zero to minus 32, and has proved capable of high speed excavation in such difficult materials as caliche and coral rock. Unit is capable of over-the-road travel at 27 mph. Diesel-powered model weighs 36,000 lb, and is mounted on heavy-duty pneumatic tires.

CIRCLE (8) ON THE REPLY CARD

NEW BLOCK-BLEED-TEST VALVES by Pacific Valves, Inc., feature dual metal-to-metal and elastomer seals. Simple visual proof test upon each closure of the valve permits operator to verify effectiveness of seat tightness. Designed to outmode the use of auxiliary line blinds, this non-lubricated gate valve is said to perform efficiently and economically within a temperature operating range of minus 40 F to plus 400 deg F. Absolute shut-off promotes operational safety and eliminates possibility of product contamination. Valves available in sizes ½ to 24-in. in the 150 lb series, and sizes 1½ to 16-in. in the 300 lb series. Brochure available.



CIRCLE (9) ON THE REPLY CARD

1. MAINTENANCE PROBLEMS

2. UNACCOUNTED-FOR GAS

3. DANGEROUS HAZARDS

eliminate them all!

FREE: *This booklet describing the causes of corrosion and how to prevent it can be yours by writing to us.*

Yes, all of these problems can be reduced, or **eliminated completely** with the proper application of a cathodic protection system using Standard Magnesium Anodes.

Standard Magnesium Anodes are designed to protect against **ALL** corrosion of your gas lines. For further information on how these anodes can help you prevent leakage contact:

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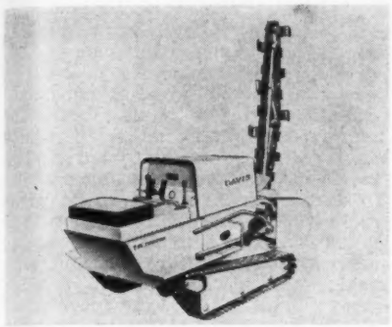
SPECIFICATION GUIDE for electrical holiday detector inspection of pipe coatings, which describes types of detectors and how they are used, is now available from Tinker and Rasor. The guide lists recommended points to be included in specifications for inspection of thin film coatings, hot applied coatings, and buried pipe or other metal structures after they are buried in the ground.

CIRCLE (10) ON THE REPLY CARD



NEW CRAWLER-TYPE TRENCHER AND BACKFILL MACHINE, Davis T-66, has been introduced by Davis Mfg. Inc. New self-propelled trencher features positive traction, hydraulic variable speed drive, instant forward and reverse, and virtually effortless control of complete trenching and backfilling operation. Unit digs 3 to 4-in. wide down to 66 in. deep; or 12-in. wide, 30-in. deep, and at varying widths and depths in between. Trenching speed is from 1 to 12 ft per minute. Backfill and transport speed is approximately 2 miles per hour. Brochure available.

CIRCLE (11) ON THE REPLY CARD

90% cut in operating and maintenance cost means

CASH in the BANK for you!

New, transistorized M-SCOPE PIPE FINDER only $189.50

Rugged, transistorized construction practically eliminates maintenance costs ... extends battery life to a year or more. Pinpoint accuracy, greatest depth penetration make the M-scope first choice in the field!

Send for FREE 1960 Catalog.

FISHER Research Laboratory, Inc.
Dept. AJ-2, Palo Alto, Calif.

FISHER RESEARCH LABORATORY, INC. of Palo Alto, California, has introduced a new all-transistorized pipe and cable finder. Elimination of vacuum tubes and other delicate parts has improved performance and reduced maintenance costs under rugged field conditions. Battery life of new transistorized units averages more than 1500 hours of continuous operation. Other features include indestructible fiberglass cases, single turn anodized aluminum loop antennas, built-in battery testers, and a detachable carrying belt for drop-handle operation.

CIRCLE (12) ON THE REPLY CARD

HOUGH WAIN-ROY HYDRAULIC BACKHOES are described in new four-page two-color bulletin recently published by The Frank G. Hough Co. Unit can be front or rear mounted; features quick attachment; 190 deg swing, digs at any angle up to 95 deg right or left; has twin boom cylinders, smooth hydraulic swing, automatic levelling, fast operating cycle, self levelling stabilizers, fast retract speeds, and long reach and high dump capacity. Operator's seat is mounted on one side of Hough "Payloader" models to provide full vision during operating cycle.

CIRCLE (13) ON THE REPLY CARD

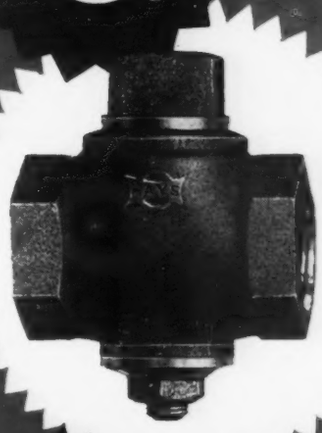
Non-linting, high-input, pilot-thermocouple combination developed by Grayson Controls Division of Robertshaw-Fulton is rated at 400 Btu per hour input with high-stability performance. Pilot is designed for use in water heaters, gas central heating equipment, and other commercial appliances.

CIRCLE (14) ON THE REPLY CARD

FISHER GOVERNOR COMPANY has available a compact, low cost ¾-in. or 1-in. service regulator, series 250, to match the small meters now being put into service. New regulator, of aluminum die cast construction, is rated at 250 cfh with 2 psi inlet pressure and 1-in. water column drop in outlet pressure; unit will handle intermediate distribution pressures up to 100 psi. Orifice and valve disc are accessible for inspection or replacement through the inlet.

CIRCLE (15) ON THE REPLY CARD

HAYS®



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for...

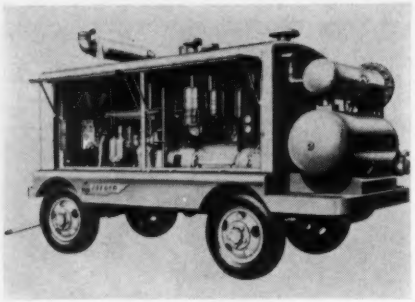
SERVICE LINES
Low, Medium and High Pressure

METER SETTINGS
Flat Head • With or Less Check
Lock Wing

INDUSTRIAL USE
Three-Way • Graduated Dial

APPLIANCES and EQUIPMENT
Lever Handle • Square Head
Flat Head
A.G.A. Listed Control Valves

GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.



ROTARY AIR COMPRESSOR recently introduced by Jaeger Company delivers 900 cfm of air at an operating speed of only 1700 rpm. Unit is powered by a Model 6-110 G.M. diesel engine which in other compressors is operated at 1800 rpm full load speed. Reduction of 100 rpm in engine speed results in a fuel factor of more than 500 cfm of delivered air per lb of fuel consumed. Engine and compressor wear are also reduced. Close automatic regulation of engine and compressor maintain 100 psi minimum air pressure under all normal demand.

CIRCLE (16) ON THE REPLY CARD

JAMES B. CLOW & SONS, INC. has compiled a 22-page booklet on ductile cast iron pipe, its unique qualities and applications. Booklet is designed to be helpful in solving pipe corrosion problems; contains tables setting forth the physical and metallurgical properties of ductile iron pipe, and comparing its corrosion resistance in various media. Booklet also gives specifications of ductile iron pipe and fittings with flanged joint, Clow Bell-Tite joint and with plain or threaded ends.

CIRCLE (17) ON THE REPLY CARD

CHARMGLOW'S NEW GASLAMP, model 700, is made entirely of aluminum. Comes complete with bright eagle finial, mantle, burner, on-off valve, pressure regulator, and 8 ft post. Entire package made to sell at moderate price. Dimensions of new lamp are 11-in. wide by 20-in. high.

CIRCLE (18) ON THE REPLY CARD

ARPS CORPORATION has developed a new one-man operated trencher, model MA-2 Trench Devil, that is designed for use by contractors, utilities, and municipalities requiring a low-cost heavy duty trencher for a wide variety of jobs including gas service lines, and gas light lines. Unit weighs approximately 1080 lb; can be easily skid-loaded on pickup trucks or small trailer, or may be transported for short distances under its own power at 3 miles per hour. There are five digging widths, 2¾, 3½, 4, 6, and 8-in. up to 54-in. deep. Digging speed is variable from 0 to 1200 ft per hr in either direction.

CIRCLE (19) ON THE REPLY CARD

PROFESSIONAL DIRECTORY

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